THE
ELECTRICAL REVIEW.

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ELECTRICAL REVIEW.

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(J. A. BERLY'S).

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MUNICIPAL ELECTRICITY SUPPLY.

WE take it that the Presidential address delivered by Mr. S. L. Pearce, chief electrical engineer to the Manchester Corporation, before the Municipal Electrical Association, may be regarded as fairly expressing the views of the municipal electrical engineer of to-day upon the many important subjects touched upon; it is true that the author makes no such claim, but as the engineer and manager of the largest municipal electrical undertaking in this country, perhaps in Europe, and President of the I.M.E.A., he occupies a position of exceptional authority, and his remarks should command the attention of the electrical world within our boundaries.

Touching first upon domestic affairs, Mr. Pearce claims that the Association has, to a considerable extent, realised the aims of its founders; we should be the more ready to agree with this view, if, in addition to the 176 "Engineer Members," the roll of the Association embraced a larger proportion than a mere eight Associate Members, and only 36 Associates (a diminishing number) out of a total membership of 390, and a possible membership of at least 1,000. The larger Institutions recognise that their vitality and growth depend in no small degree upon the prosperity of their Students' Sections, a feature which appears to be lacking in the case of this Association. Is not this an unhealthy condition, and would it not be advisable to take measures to remedy the deficiency?

Turning next to finance, the President points out that since 1897, when the second annual Convention was held in Manchester, the capital invested in municipal electricity works has increased from 3½ millions to the gigantic figure of £83,860,000—an enormous advance, indeed; this, together with the fact that practically the whole of the plant originally installed at Manchester by Dr. Hopkinson has now been replaced by newer designs, naturally leads to the consideration of the financial stability of the industry under the municipal *régime*, a matter which Mr. Pearce regards as the most important aspect of a committee's policy. We do not wonder that he insists upon the necessity of providing for renewals of plant before making contributions to the rates; he says: "It is now generally accepted that in so far as the statutory sinking fund instalments unaided will not provide for the redemption of the loans for short-lived assets by the end of the term fixed by the sanctioning authority, some additional charge against revenue is necessary, to provide for either the repayment of the balance of the loan then outstanding, or a corresponding part of the cost of the renewal of these assets. It is desirable that this supplementary charge on revenue should be annually apportioned." This is sound finance; we cordially welcome the support of Mr. Pearce to the policy for which we have for so many years contended. Our attitude, we know, has frequently been interpreted as one of hostility to municipal enterprise, though we have repeatedly repelled the charge. To legitimate

municipal trading, on sound and safe lines, we do not take exception; but we have consistently opposed the incessant attempts to treat the sinking fund as an adequate provision for depreciation and obsolescence of plant, of which the Manchester undertaking presents so striking a series of examples—first belt-driven dynamos, then direct-coupled steam dynamos, then direct-coupled steam alternators, and finally, the largest steam alternators of their kind in the kingdom, have successively become out of date, to say nothing of switchgear, motor-generators, mains and other important and costly items—all within 16 years! Well may Mr. Pearce say, "Too often, it is feared, moneys are taken in relief of the rates which should have been applied in provision for renewals or depreciation." We, at any rate, have done our best to advocate a sound financial policy, and we rejoice to learn that the views we have put forward are now generally accepted.

Whether the object of municipal undertakings should be to supply at or near cost price, or to make a profit for the relief of the rates, is, as Mr. Pearce says, arguable. It is also a subject upon which an immense amount of nonsense has been uttered, by municipal politicians whose lack of knowledge has been equalled only by the emphasis of their contentions. We used to be told that "in a few years' time this magnificent undertaking will be free from debt, and vast profits will be made for the benefit of the citizens." Even the use of the word "debt" has been cavilled at—"borrowed capital" sounds so much better. But it is the same thing, and just as all other capital needs renewal, so capital borrowed by municipalities must be renewed continually—freedom from debt is but an aspiration, destined never to be fulfilled. We incline to the opinion that electricity should be supplied at the lowest rates compatible with due provision for depreciation and antiquation, together with the formation of a substantial reserve fund to meet contingencies. Those who contribute most heavily to the rates, and who would, therefore, benefit most by the allocation of profits to the latter, are also those who consume the largest amount of electrical energy and employ the greatest number of persons; the supply of cheap energy, like cheap water supply, is of great benefit to the community, and it is very questionable whether the few shillings that a small tradesman would gain through contributions to the rates from the electricity department would be at all comparable with the advantages that he would derive, directly and indirectly, through the supply of cheap energy. As for the small householder and the working man, in many cases they would gain nothing at all from the alleged "relief" to the rates, which are often paid by the landlord.

Mr. Pearce next deals with the effect of the metallic-filament lamp upon the industry, and here again we agree with his view that it will eventually prove wholly beneficial, though, for a time, its benefits may be partially disguised, from the station engineer's point of view. Plant will be set free to supply power, and the load factor will benefit by the relatively increased proportion of the power load. To increase the price of energy would, as Mr. Pearce remarks, be a very questionable policy.

Touching on the proposition that has been under the consideration of the Association (and the I.E.E.) lately—the introduction of regulations permitting of cheapened systems of wiring—Mr. Pearce expresses the view that the use of flexibles above a given height from the ground, except where wires pass through walls or floors, is not inconsistent with the maintenance of the present standard of safety, a condition essential to the adoption of any such system; he also points out that economies can be made by increasing the limit for the number of lamps to be installed on a two-wire service, so as to avoid the expense and inconvenience of wiring a house on the three-wire system, and by increasing the number of lamps permitted on a single circuit. Obviously, the introduction of high-efficiency lamps has made all such rules out of date, and in future they had better be formulated on a basis of amperes instead of lamps.

As may be supposed, the chief electrical engineer to the Manchester Corporation has not overlooked the importance of power supply, to which, he thinks, electrical undertakings will chiefly have to look in the future for their development. While acknowledging the importance of inquiring whether the prices obtained are remunerative, lest an undertaking should find itself landed in a critical position, he believes that the majority of power tariffs are framed on a remunerative basis, and gives his approval to the theory that where extensions of generating plant have been necessitated by the growth of the power load, and have been carried out at the cheap prices now possible, the power users should only be required to pay a correspondingly small proportion of the capital charges. This appears reasonable, provided that the whole of the power users get the benefit of the low rates. Mr. Pearce seems to hold that the particular power users whose demand has led to the increase in plant should have the preference in this respect, a view with which we cannot agree, and which, we believe, would be illegal if put into practice.

The advantages of co-operation between large and small municipalities are touched upon in the address; there is no doubt that in very many cases the small authorities would be well advised to purchase energy in bulk from their bigger neighbours or from power companies, and many of them have already learnt the wisdom of this course. Lastly, Mr. Pearce emphasises the necessity for the municipal electrical engineer to look after his status; there is no doubt that attempts are being made to belittle his importance, and not only in his case, but in that of every engineer, the question of status is assuming greater and greater moment.

Limitations of space forbid further reference to the interesting points raised in Mr. Pearce's address, which should provide food for serious thought amongst electrical engineers in general.

Our Annual Tables.

THE issue to-day of our Table of Electricity Works of the United Kingdom completes the annual dose of statistics and data that we serve up for our readers. The number of stations has not materially increased, and as in the case of the tramway undertakings, but little change has taken place in the existing installations—this being largely due to the influence of the metallic-filament lamp, which has unquestionably checked increase of output, and has in some cases caused an actual decrease. The constant growth of the power load, however, except in the purely residential districts, has gone far towards counteracting this effect, and in the majority of cases the output shows an advance. This, combined with a reduction in the peak load, means an improved load factor. We sincerely thank all the engineers and managers who have furnished data, and only regret that the necessity of publishing the table at this date prevents us from including the latest results of a number of works. But this would happen, no matter when we published it.

Comparisons of Costs.

WHEN Mr. Pfeiffer read his paper on the Diesel engine, he paid a compliment to the author of a recent paper by using some of the figures it contained; his reward for doing so was that the author of the paper quoted declared that the figures in question were not truly representative of the facts, and, therefore, Mr. Pfeiffer had fallen into grave error by the use thereof. Now this is all very well as a means of attack, but, incidentally, does it not recoil upon the author of the paper quoted? The particular figures purported to be figures of sub-station costs, and were accepted in good faith; but now they are seen not to be representative figures, but merely figures for a more than ordinarily costly instance. We cannot see that Mr. Pfeiffer was to blame for quoting the figures; apparently, had it not been for his bringing them forward, we should never have learned that they were really of no value as a guide.

But is there not too much of this comparison of station costs? Every case is so distinct that there can be little value

in comparisons between steam and gas power or oil power stations. Every case must stand by itself, and every author who draws comparisons will tend to select such cases as fit his views. Particularly in the selection of motive-power is it necessary for an engineer to make his calculations for his own special case, whether it be for steam or for internal-combustion engines of either order; and when he has satisfied himself on the point of fuel economy, it by no means follows that he has reached a final conclusion. Generally speaking, long hours are favourable to steam power, because the stand-by losses are reduced, and become nil for a 24-hour day. The Diesel engine has no stand-by losses, and therefore shows up well when working hours are short. So much in every case depends on environment, that it is futile to attempt to draw comparisons with any expectation that they will prove acceptable to men whose particular experience is with different surroundings.

Electricity in N.S.W. Coal Mines.

Some months ago there was considerable correspondence in our columns on the difficulty that an ordinary colliery manager, without special electrical knowledge, experiences in distinguishing between a reliable and an unreliable electrician, when choosing a man to put in charge of the electrical plant of his mine. Safety of life and property are in the care of such men, and the opinion was strongly expressed by some correspondents that an official certificate should be required before an electrician is allowed to assume such grave responsibility.

It is not in England alone that the danger of employing incompetent men has been felt. In New South Wales, where a Coal Mines Regulation Act has been in force for many years, the Government in 1907 appointed a Committee to inquire into the use of electricity in coal mining, comprising the following:—Mr. Justice Murray, chairman; Prof. T. W. E. David, since of Antarctic fame; Mr. O. W. Brain, M.I.E.E., electrical engineer to the Railway Commissioners of N.S.W.; Mr. A. E. O. Sellers, M.I.M.E., manager of the South Bulli and Bellambi Coal Mines; and Mr. James Curley, secretary to the Northern Miners' Federated Institute. The Committee recommended the Government to adopt a modification of the 1907 British Regulations, then only recently issued. The chief alterations proposed were in the direction of making the rules more strenuous, and amongst other provisions was one providing for the examination of, and issuing of certificates of competency to, mine electricians. The rules as thus recommended being objected to by the mine-owners, were, in accordance with the provisions of the Act, made the subject of arbitration, the Mines Department and the colliery-owners being equally represented. As a result of this, further modifications were introduced, and the rules were eventually issued with Departmental authority.

Subsequently, in December, 1908, a short amending Act was passed, providing, first, for the appointment of an Electrical Inspector with all the powers of an Inspector under the principal Act; and, secondly, that at every mine with electrical plant exceeding 30 KW. there should be employed a mine electrician holding a certificate to be granted by the Department to such persons as should have successfully passed an examination in the use of electricity in and about coal mines, and in the special rules governing this use. The Act also provided for the appointment of examiners and other minor details.

Mr. W. Corin, M.Inst.C.E., M.I.E.E., who last year was appointed electrical engineer to the Department of Public Works and Consulting Electrical Engineer to the Department of Mines, received the additional appointment of Electrical Inspector under this Act, as well as that of Examiner of candidates for mine electricians' certificates, in conjunction with two other Examiners, Mr. A. E. O. Sellers, named above, and Mr. A. E. Warburton, manager of the West Wallsend Colliery.

The first examinations were held at Newcastle, N.S.W., on May 4th and 5th, and at Sydney on May 11th and 12th. Sixty-eight candidates presented themselves for examination, and out of this number 30 obtained certificates. There are in New South Wales some 40 pits with electrical plant varying from a few horse-power up to 500 KW. Only about half this number are over 30 KW., so that quite sufficient electricians have been certificated to supply the mines of the State.

Henceforth, in the coal mines of New South Wales, or at least in those with plants exceeding 30 KW., a limitation with which we do not quite agree, qualified men will be in charge of apparatus which might otherwise be a fruitful source of danger to life and property, and we are of opinion that the Mother Country might do worse than follow the example thus set by one of her offspring.

Belgian Banks and Electrical Enterprise.

It is probably not generally known that quite independently of the support rendered by German banks to electrical enterprises of various kinds in that and other countries, a similar state of affairs has prevailed in Belgium for a number of years past on a somewhat smaller scale than in the Fatherland, whilst the investment branch itself has developed in Belgium to fairly large proportions in relation to undertakings in many countries. The latest instance of Belgian activity refers to the electric lighting work carried on in St. Petersburg under concessions which will expire in 1937. At the present time there are three supply companies in the Russian capital, namely, the Société Belge d'Eclairage, the St. Petersburg Gesellschaft fur Elektrische Anlagen, and a third undertaking which is possibly a native enterprise. The first mentioned, as indicated by its title, is a Belgian company, and two-thirds of the total share capital of £1,160,000 issued by the second company has hitherto been in German ownership, the Helios Electricity Co., of Cologne, being represented by a very considerable sum. At one time the three companies severely competed with each other, but an agreement was arrived at in 1901, thus bringing the rivalry to an end. The present transaction relates to the transfer almost entirely to Belgian hands of the two-thirds of the capital held by Teutonic shareholders in the St. Petersburg Gesellschaft fur Elektrische Anlagen. The new company, which bears the title of the Compagnie Générale Auxiliare d'Entreprises Electriques, has just been formed in Brussels with an ordinary share capital of £400,000.

The Société Belge d'Eclairage de St. Petersbourg does not appear among the subscribers of the ordinary capital. It is, however, largely interested in the new company by way of founder shares, and possibly in the issue of £360,000 in obligations, and its technical assistance will be at the disposal of the latter which has now assured itself of the control of the St. Petersburg Gesellschaft. The circumstances, therefore, suggest that the transaction represents a preliminary step in the direction of converting the controlled company completely into a Belgian undertaking, or of its ultimate amalgamation with the existing Belgian electric lighting company. The German shares have been taken over on the basis of the exercise of an option made at 73 per cent., and it is calculated that the liquidators of the Helios Electricity Co. will receive as their share a sum of from £425,000 to £450,000 for distribution among the bondholders in the latter company. The curious fact in connection with the operation is that the Germans, other than the Helios Co., have been willing to dispose of their substantial holdings in the St. Petersburg Co. at a financial sacrifice. The failure to find German purchasers on the one hand, and the readiness of other Teutonic shareholders to sell their holdings on the other, seem to point to the belief that the municipal authorities of St. Petersburg will exercise their right of expropriation as from the year 1917, without awaiting the expiration of the concessions in 1937. A contrary belief has, however, been expressed in interested Teutonic circles on account of financial considerations in St. Petersburg. If the German opinion should eventually prove to be incorrect, it will probably be found that the Belgians have not made such a satisfactory bargain as is apparently considered to be the case in that country at the present moment.

D

THE I.M.E.A. CONVENTION.

This year's Municipal Electrical Convention, the fourteenth of the series, has been held, mainly in Manchester, during the past week.

Passing over the reception and conversazione by the Lord Mayor and the Lady Mayoress (Alderman and Mrs. Edward Holt) at the Town Hall, on Monday evening, a function the success of which can be gauged from the attendance of over a thousand guests, the real business of the Convention commenced on Tuesday, when the proceedings were opened by the Lord Mayor at the Manchester Municipal School of Technology.

His Lordship, in welcoming the Association, said he was one of those who believed in making a reasonable profit on the sale of electricity, but his Electricity Committee did not altogether agree with him; further, he thought that the question of competition between municipal departments ought to be a matter for adjustment. Municipal trading departments were subject to trade fluctuations in the ordinary way, and suitable financial provision must be made. He paid a tribute to the undoubted ability of Mr. S. L. Pearce (or Preece, as one worthy from West Yorkshire would have it) and of his committee, who had jointly helped forward the success of the Manchester Electricity Department.

The President, Mr. S. L. Pearce, suitably replied, and then read the presidential address, which is dealt with in our leader pages this week. Councillor A. Sinclair, of Swansea, followed with his paper on "Cheap Units," which elicited a somewhat desultory discussion, chiefly remarkable for Mr. A. M. Taylor's proposal to give midnight consumers a "100 per cent. discount" on prevailing rates, with a view to filling up blanks in the load curve.

We sympathise with Mr. Taylor's plea for drastic measures in order more effectually to utilise plant capacity, but the system of giving discounts to suit circumstances is, we believe, fairly general, although we have never heard "100 per cent."—whatever that may mean—mentioned before.

Subsequently the members and visitors adjourned to the Town Hall, where they were entertained to luncheon by the Manchester Electricity Committee.

Among those present were Mr. S. Z. de Ferranti, Mr. Alex. Siemens, Sir T. T. Shann, the Dean of Manchester, &c., and in addition to the loyal toasts, "The Incorporated Municipal Electrical Association" was proposed by Councillor S. W. Royce, J.P., and replied to by the President; also "The Manchester Corporation Electricity Committee," proposed by Alderman Pearson, Bristol, and replied to by Councillor Howarth, J.P., chairman of the Manchester Electricity Committee.

Manchester Town Hall is a gloomy building, and the large hall, where the luncheon was held, is not famed for its acoustic properties; hence the visitors, except those in the immediate vicinity of the speakers, were unable to learn much of the toasts beyond what might be gathered from the menu cards.

The afternoon was given up to visits to the various Manchester generating stations (which have been fully described in these columns), special cars being provided by the Corporation.

Wednesday's proceedings took place in Liverpool, where the members were welcomed in St. George's Hall by Sir Charles Petrie, chairman of the Electric Light and Power Committee of the Liverpool Corporation.

Papers were read by Mr. E. E. Hoadley, of Maidstone, on "The Influence of Metallic-Filament Lamps on the Electrical Industry and on Street Lighting"; and by Mr. E. M. Hollingsworth, of St. Helens, on "Modern Cable Systems."

At the conclusion of the morning's business an adjournment was made to the Exchange Hotel, where the members and friends were entertained to luncheon by the Liverpool Tramways and Electricity Committee.

The afternoon was devoted to visits to the Lister Drive generating station and to the Cunarder *Mauretania* (Electrical Review, April 3rd, 10th and 17th, 1908), afternoon tea being provided in the saloon of the latter by the Cunard Co.

On Thursday, the Manchester Technical School was once more the meeting place. Papers were read by Mr. A. S. Blackman (Sunderland) on "Steam Turbines from the User's Point of View," and Mr. E. Lunn, of Huddersfield, read his travelling studentship prize paper on "Notes on Condensing and Water-Cooling Plants."

A number of local works, including those of the British Westinghouse Co., were open to the visitors during the afternoon, and in the evening the annual dinner took place at the Midland Hotel.

With to-day's annual general meeting and visits to the electricity works of the Salford Corporation, Lancashire Power Co.'s and other works, the Convention closes.

Cheap Units.

By Councillor Alex. Sinclair, Chairman of the Electricity Committee, Swansea.—(*Abstract.*)

The author's attention was recently arrested by the effect of a number of large consumers temporarily ceasing to take their ordinary supply; in fig. 1 the hatched portion shows the latter, while the unhatched area shows the usual town supply for the same time of year. It was found that the works cost per unit generated showed an increase out of all proportion to the decrease in output, indicating that the units shown by the hatched portion of the curve must have been very "cheap units." The chart represents a typical June dayload; the dayload factor for the whole is 5·59 per cent., while without the load shown hatched it is 44·5 per cent.

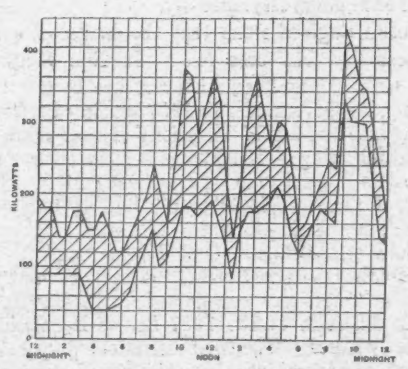


Fig. 1.—Typical Load Curve.

The benefit of the additional dayload is clearly seen; the drawback of a demand being made on peak-load must not be forgotten, but as this occurs on only a few evenings in the year, and then only for half-an-hour or so, it is not so important as it might appear. The maximum peak for the year, 1,076 kw., included only 130 kw. for the large power users. Some hold that this might be dealt with by the overload capacity of the plant, but the author would reserve this for emergency only, and considers that the plant capacity required to meet the demand on peak-load should be the measure taken for allocating capital charges to a large power user. The paper deals only with towns where the demand is not limited to any particular hours. The large user's demand fills up the low part of the load curve, while the peak increases but slowly; it is difficult to imagine the lesser peaks exceeding the highest value of the peak-load in the year.

The works cost for large power supply was less than ·25d. per unit during the periods dealt with; such units should bear a fair proportion of the costs incidental to the generation of the whole. Taking a typical station having an annual output of 2 million units, the author classifies the supplies under five heads, with the following demands, &c.:—

A. Early closing shops and offices.
B. Late closing shops and offices, private houses, theatres, hotels, &c.
C. Small users of power.
D. Public lighting; and
E. Large users of power.

	B. of T. units.	kw. max. demand.	Load factor.	Cost per unit.		Total cost.
A. ...	330,000	358	10·5 %	2·02d.	=	£2,778
B. ...	464,000	396	13·38 %	1·64d.	=	3,171
C. ...	400,000	160	28·50 %	·85d.	=	1,416
D. ...	226,000	56	46·00 %	·54d.	=	508
E. ...	580,000	130	50·90 %	·49d.	=	1,184
	2,000,000	1,100	20·75 %	1·08d.		£9,057

The costs are calculated from a table compiled by the author, giving the total cost of production per unit for different load factors, a few of which are given below:—

Load factor.	A Total cost per unit.	B Capital cost per unit.*
10 %	2·10d.	2·30d.
15 %	1·46d.	1·533d.
20 %	1·11d.	1·150d.
25 %	0·94d.	0·920d.
30 %	0·818d.	0·766d.
40 %	0·630d.	0·575d.
50 %	0·500d.	0·460d.
60 %	0·450d.	0·383d.

* At 7 % on £120 per KW. of max. demand.

As ideal costs the author gives: Coal, 0·20d.; oil, waste, &c., 0·01d.; wages, 0·06d.; repairs, 0·04d. = works costs, 0·31d.; rent, rates, &c., 0·02d.; management, 0·03d. — total costs, 0·36d. per unit. Stalybridge is quoted as having attained 0·45d. per unit, showing that the ideal is not far beyond the possibilities, but the author takes 1·11d. per unit as total costs on a 20 per cent. load factor as fair present-day practice for the typical station.

He considers that all units should bear their fair share of the capital charges, and that the consumer's load factor should be the basis for determining this in each case. When a large power consumer is cut off during the peak, he will be assessed only on the value of the cables used for his supply, at, say, 12 per cent. if new cables are laid, to which must be added the total works cost obtained from the table given above.

In general, using the table, the five classes of demand would cost as follows:—

	Capital charge per unit.	Total cost.	Total.	Total cost of above supplies.
A. ...	2·19d.	£3,100	4·21d.	£5,788
B. ...	1·72d.	3,325	3·36d.	6,496
C. ...	0·81d.	1,350	1·66d.	2,766
D. ...	0·5d.	471	1·04d.	979
E. ...	0·45d.	1,087	0·94d.	2,271
		£9,243		£18,300

The figures are approximate only.

In the circumstances under discussion, it would appear that a fair selling price for such supplies, whilst leaving a margin of profit, would be:—

A. 4½d. per unit. B. 3½d. per unit. C. 1¾d. per unit. D. 1½d. to 1¼d. per unit. E. 1d. to 1¼d. per unit.

The author's investigations of the maximum demands of all these phases of supply brought to light a peculiar coincidence in that the sum of all the maximum demands was almost exactly twice the actual maximum demand of the station, which would seem to prove two things, first, that the top peak is not the only determining feature in fixing a price; and, secondly, that the diversity factor of a power and heat load is good.

Manufacturers can only be induced to take energy from a public supply undertaking when the price is sufficiently low to be attractive, and the object of this paper is to show that such figures can be quoted, and still leave a fair margin of profit; a further object is to bring to the notice of chairmen and members of committee that good business is often lost by trying to obtain too high prices.

Discussion.

Mr. A. M. Taylor said the author had taken three cases of power consumers and methods of dealing with their load at peak times; he, the speaker, was most interested in the case of a power consumer who was cut off during the peak, and he could not agree that 6d. was too low a charge—it was too high for extra units, as it should include no standing charges, &c. He submitted that it was possible to arrange suitable discounts—"keep off" and "come on" discounts—which would offer every inducement to consumers to take supply at all hours. Inadvertently, we suppose, Mr. Taylor proposed a "100 per cent." discount for midnight consumers, with a view to filling up this idle part of the day.

Mr. H. Richardson (Dundee) cautioned the members against being led away by the craze for cheap units. Every case must be considered on its merits, the engineer's aim being to obtain the best price for his supply. Simplicity in charging was also a desirable feature.

Alderman Higham (Accrington) spoke as a Lancashire manufacturer, and assured his hearers that it was idle to suppose that the rates usually quoted in manufacturing towns would secure mills and works as consumers. The figure of 608d. per unit mentioned in the paper, was of no use to the cotton mill. His own concern was producing energy, including the warming of the mill, at 34d. per unit, and he suggested 25d. per unit as a more reasonable figure.

Mr. E. E. Hoadley (Maidstone) agreed that the author's prices were much too high for the large manufacturer, and he commended the recently published returns of the West Ham Corporation to the meeting, as being worth studying. It was necessary, owing to this question of power supply, to find out accurately the cost of "extra" amounts, and this he had done, noting the costs and output of consecutive Thursdays and Saturdays, and calculating from the difference.

Mr. Ashton Bremner (Buralem) said that although he had gas at 1s. per 1,000 cb. ft. to contend with, yet he was able to compete in power supply. As showing the influence of a large consumer even at a low figure per unit, he mentioned that at Buralem, with only half a million units output per annum, they had taken on a large consumer at ¼d. per unit.; this consumer's load factor was 69 per cent., and his additional load had reduced the costs all round. He thought that much business was lost owing to too high charging.

Mr. W. W. Lackie (Glasgow) disagreed with the author as to difficulty in obtaining consumers' load factors; these were readily obtainable by the maximum demand apparatus, and he believed that each consumer should be charged on his load factor and bear a fair share of the standing charges.

Mr. Leach (Farnworth) said no one had the right to penalise any consumer by special charges, and competition must be met on equal terms. His experience with time switches at Aston Manor had been anything but happy.

Mr. S. E. Fedden (Sheffield) wholly disagreed with the bulk of the paper, and particularly with the employment of extra apparatus in connection with charging systems. He believed in plain charges, with discounts fixed according to the conditions of supply.

Mr. H. Faraday Proctor (Bristol) said opinions differed as to what was a fair share of capital charges, and he considered that power load capital charges could be taken on a lower basis than those for lighting.

Ald. Bruce (Sunderland) pleaded for charges based on ordinary business conditions, and concluded that the author's prices were too high.

Councillor Sinclair briefly replied, and the meeting terminated.

Cheap Units.

The author of the paper on this subject has endeavoured to arrive at "something like a basis from which to calculate on its merits the selling price of each class of unit."

The subject is not by any means new, neither is the method of handling the same, and it speaks volumes for the apathy of present-day engineers when the task of treating a subject of such vast importance to the industry generally is relegated to one—no matter how keen an interest he may take in the problem—who cannot be expected to possess the requisite knowledge to evolve a satisfactory solution.

The mere fact that mention is made only in a short paragraph of the dominating factor in fixing a fair charge for any class of supply—viz., the diversity factor—goes to prove that the subject has not received that amount of study which must be given before a definite law can be laid down which will curtail the interminable series of papers on the subject.

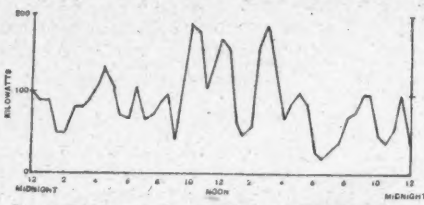
The author has assumed, like many of his predecessors, that the lighting load should bear the full cost of the maximum supply demanded from the generating station, and the consumers constituting this class may only expect to receive benefit from their individual load factors, whereas the power consumer should reap the whole of the benefit derived from the diversity of a combined demand for lighting and power.

He has not endeavoured to arrive at his conclusion by logical methods, because he dismisses the phase presented by a supply to restricted-hour consumers and those that do not require to take a supply at the time of maximum demand. But surely, if it is proper to charge a power consumer with the standing charges entailed by a demand of 130 KW. at a time when the majority of the lighting consumers are making their maximum call, notwithstanding the fact that the said power consumer may have made a demand of 200 KW. to 250 KW. in another part of the same day, it may be assumed that a consumer who does not make any demand whatever at the time of the maximum should pay no standing charges at all. We quite appreciate the reason why the author does not care to dwell upon this phase of the question, because no argument can be brought to substantiate this assumption. Anyone utilising energy at *any* time should bear a fair share of the capital cost of the plant necessary for production. We do not undertake to state the exact proportion of the standing cost that each consumer should bear, but we emphatically state that, having fixed an amount for this service, the supply undertaking need not trouble about the consumer's load factor. If a fixed annual charge is made to each consumer in accordance with the nature of the demand made, and a profitable return for the supply of energy is received, no one other than the consumer is concerned with the ultimate price per unit, and therefore such papers as this need never be written.

But to criticise the paper as read, we cannot reconcile the statement made on page 2 to the effect that the load between midnight and 4-5 p.m. is characteristic of the whole period,

notwithstanding the close investigation of the load curves for the year by the author, with the typical curve given in the paper, which shows that the large power consumers' load at midnight commencing the curve is quite 100 KW., and at midnight following is only 40 KW.

We also think that if the author had plotted a curve of these large consumers' loads separately from the combined curve, as shown below, probably the result would not have appeared to him of such value as indicated in the paper.



LOAD CURVE OF LARGE POWER USERS ALONE.

This curve does not differ materially from that which would be produced from the supply to a number of small intermittent consumers.

Using the author's method (page 3) to arrive at the value we find the following results :—

$$\frac{2{,}181 \text{ units} \times 100}{190 \text{ KW. M.D.} \times 24 \text{ hours}} = 47{\cdot}8 \text{ per cent.},$$

or a shade better than the ordinary power and lighting load combined.

We do not know how the author arrived at the cost per unit generated for this particular day in June, but we unhesitatingly assert that it is impossible for any undertaking with a total cost of 1·11d. per unit sold to produce energy in a 24-hours' run on a load as indicated in the curve at a cost below 0·25d. per unit generated, and can only conclude that the author's scrutiny of the costs of the station has not been as reliable as he would have us believe.

We do not know whether to admire or deplore the very naive reference to the importance of the demand of power consumers over the peak load which "occurs on only a few evenings in the year and then only for half-an-hour or so." We would remind the author that if the maximum demand occurs twice in one year it is a coincidence, and never lasts "for half-an-hour or so." But whenever it occurs, no matter how long it may last, provision must be made for it, and very costly provision it is.

Why should not the overload capacity of plant be treated as an asset and taken into calculation in providing for the maximum demand? Surely if such demand is rare and only lasts for half-an-hour, it may be treated as an emergency case. Can it be that the author has little reliance upon the overload guaranteed by the makers of plant?

We agree with the author on page 4 where he states that it is difficult to imagine that the day load could overwhelm the overlapping load caused by a combined lighting and power demand, but it is not impossible, should the power demand exceed the lighting demand to a great extent, especially in foggy weather; but it is impossible to us to "imagine a position arising where the *lesser* peaks for three-fourths of *any day* would top the *highest peak obtained in the year*."

With reference to the tables on page 8, we fail to understand the law underlying Table A. In calculating the cost of supply, it is necessary to fix a standing charge on the principle applied in Table B. To this must be added a charge for running cost which is constant. Two tables are unnecessary, as Table B would include all standing charges, and the simple addition of the constant would give the cost for any load factor. We find in Table A, for 10 per cent., 20 per cent., and 60 per cent. the constant is 0·12d. per unit, and, applying this to the author's figures, we get in the majority of cases a totally different result.

In only four cases is the author correct, and he is as far out as ·039d. at 31 per cent., calculation being made to the third decimal place only as adopted by the author.

Although the table appears not to be constituted upon any given basis, the inaccuracies shown would not of themselves be of so much importance if it were not for the fact that the running cost is palpably taken at 0·12d. per unit. Such a figure is, of course, totally inadequate for any undertaking where the total cost per unit is as high as 1·11d. with a station load-factor of 20 per cent.

We suggest that 0·3d. per unit would be a moderate estimate of running cost, and on this basis we submit the following statement for the author's consideration :—

Class.	KW.	Load factor.	Standing charge.	Running cost.	Units sold.	Total cost.	Pence per B.T.U.	Author's cost. B.T.U.
A	358	10·5 %	3·74d.	0·3d.	330,000	£5,552	4·04d.	4·21d.
B	396	13·38 %	2·94d.	0·3d.	464,000	£6,270	3·24d.	3·36d.
C	160	28·5 %	1·36d.	0·3d.	400,000	£2,798	1·68d.	1·66d.
D	56	46·0 %	·85d.	0·3d.	226,000	£1,087	1·15d.	1·04d.
E	130	50·9 %	·77d.	0·3d.	580,000	£2,593	1·07d.	0·94d.
	1,100	20·75 %	1·89d.	0·3d.	2,000,000	£18,300	2·19d.	2·19d.

Assuming that the maximum demand of each class is estimated correctly, and the output is doubled by quadrupling the supply to large power consumers, the other classes remaining stationary, the loss to the undertaking would be 2,340,000 units at 0·13d. = £1,267. This is a serious item, and the assumed circumstances are quite likely to occur where tempting power prices are offered and the use of metallic lamps is increased.

Reviewing the paper as a whole, we are bound to admit that the author has shown a keen interest in the working of the undertaking over which he is chairman; but we think, in connection with a highly technical subject of this description, it is impossible for anyone in the author's position, notwithstanding his close connection with the industry in a general way, to become thoroughly conversant with the intricacies of the problem he has attempted to solve. These subjects are better dealt with at the hands of those whose everyday duty brings them in close contact with every phase of central supply. Even the latter have not yet solved the difficulty of charging for a universal supply of energy upon an impartial basis.

CORRESPONDENCE.

Letters received by us after 5 P.M. on TUESDAY cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.

Lightning Phenomena.

I notice that Mr. Swan in this week's REVIEW gives some experience of lightning effects, and I should like to add some similar experiences that we had here about six weeks ago.

During a severe storm which occurred about 3 o'clock in the afternoon, between 40 and 50 lamps in different houses, scattered over a considerable area, had their filaments broken. These lamps in nearly all cases were in bedrooms, and were not alight at the time. Pieces of the filament were stuck to the side of the glass, as Mr. Swan noticed.

I have since made some experiments in conjunction with the Principal at the Technical College here, to try and account for this, and we found on bringing a lamp close to the spark-gap of an induction coil, that the filament was set in violent vibration and very soon broken. This suggested that the filament became alternately charged and discharged statically, the loops of the filament repelling one another when charged, and springing back when discharged; the action really being similar to that of a gold leaf electroscope. To test the matter further, a lamp was placed in a holder and one terminal connected to a terminal of a Wimshurst machine. When the machine was set in motion, the loops of the filament expanded outwards, apparently repelling one another, and when a spark was allowed to pass they sprang back again; if the machine was allowed to continue sparking, the filament was set in violent vibration. On connecting the lamp, however, to the other terminal of the machine, the filament, instead of expanding as we expected, contracted, the loops of the filament being drawn together and springing outwards when a spark passed.

The matter was further complicated by our finding that in some lamps, when connected to the positive terminal, the filament expanded, while in others it contracted, the opposite effect taking place when connected to the negative terminal.

It looked as though there must have been a strong charge on the inside of the glass which would cause attraction or

repulsion of the filament, according as to whether it were similarly or oppositely charged, and this seemed to be confirmed, as on removing the glass from three lamps we found that the loops of the filament mutually repelled one another in each case, whatever the polarity of the charge. Though why the glass should have become positively charged in some cases and negatively in others, was not very obvious.

However, it was clear that during a lightning discharge the filaments might be set in very violent vibration, which would account for the lamps being broken.

As regards the other phenomenon noticed by Mr. Swan, there is no doubt that the mains must have become momentarily charged to a high potential, and this found out any weak places in the insulation of flexibles, &c.

The blowing of fuses may have been due to short circuits in the flexibles, or possibly filaments in the lamps crossing, but apart from this, I think it is quite possible for a very heavy current to be induced in electric lighting circuits without the wires being actually struck. We had a case here where some disused telephone wires leading to a house were struck, the current passing by means of an earth wire to the water tap which was just inside the house; there was no connection whatever between the telephone wires, or the water pipes, and the lighting wires, but both the main fuses and the fuses on the four-way distribution board were all blown with very great violence, so much so that the glass in front of the distribution board struck the wall on the opposite side of the room 12 ft. away.

The excessive current also had the effect of making the meter, which is of the mercury type, about 26 per cent. fast.

F. M. Long,
City Electrical Engineer.

Norwich, *June 16th*, 1909.

Specifying for Sound Workmanship.

I was pleased to see the letter signed "Reform" in your issue of 11th inst., and am at one with the writer, that, as a rule, in specifications, too little stress is laid on the class of workmen who shall carry out the specified work. There is far too much shoddy work done in the present day, not only by inferior workmen, but also by incompetent parties who style themselves consultants.

I know of a case where an architect endeavoured to make up a specification of his own, from a consulting engineer's old specification, which resulted in a perfect muddle.

I have also met architects who have had proper specifications drawn up by good consultants, and in superintending the work themselves have spoiled what might otherwise have been a good job if entrusted to a firm of standing. They were utterly unfit to discern the quality of the labour, and unable to tell the quality of the material palmed off upon them.

What the trade requires in its own interest is the competent workman and the competent consultant. At the same time I would voice "Reform's" views, that there are occasions where the firm of standing would do better for the client by expending the latter's fee on the job. But in work involving plant a good consultant is advisable. Purely wiring jobs, such as houses, shops and the like, might with every satisfaction be entrusted to the honourable contractor.

Swithin.

The P.O.T. and the Grouping of Cells.

From the new edition of his "Telephony," it seems that Mr. T. E. Herbert (engineer, Post Office Telegraphs) has independently and empirically discovered that the usual rule for the regular grouping of cells for maximum current is inaccurate, but that it becomes accurate if we insert the words "logarithm of the" immediately before the word "resistance," thus making the rule read as follows:—"The greatest current is obtained when the logarithm of the resistance of the group is as nearly as possible equal to the logarithm of the resistance of the external circuit." I think he must have arrived at this independently and empirically, because, in the first place, he does not tell his readers that a mathematical proof of the rule (or, rather of the law from which the rule is easily deducible) is to be found in my pamphlet on the "Grouping of Electric Cells," which was published in 1906 and discussed in your columns in November of that year; and, in the second place, he immediately afterwards gives another rule, which he apparently considers an improvement on the first, but which is, as a matter of fact, inaccurate and directly contradicted by the law just referred to. This second rule states that the current will be greatest when the number of cells in series is as near as possible to $\sqrt{NR/r}$, where N is the number of cells to be grouped, R the external resistance, and r the resistance of each cell. Applying this rule to the case of 12 1-volt and 1-ohm cells and an external resistance of 6·7 ohms, we find that the number of cells in series should be as near as possible to $\sqrt{12 \times 6{\cdot}7}$, or $\sqrt{80{\cdot}4}$: that is to say, it should be 6 (since this square root is smaller than 9, and, therefore, nearer to 6 than to 12). But with six cells in series, the current is only $6/(3 + 6{\cdot}7) = 0{\cdot}618$ ampere; whereas by putting the 12 cells all in series, in accordance with my rule, or Mr. Herbert's first rule, or any other rule that is deducible from the law that was first stated in my pamphlet, we could get a current of $12/(12 + 6{\cdot}7) = 0{\cdot}642$ ampere.

W. F. Dunton.

London, W.C., *June 17th*, 1909.

E.M.F. in a Dead Underground Cable.

The last sentence in Mr. Abraham's letter is certainly straight and to the point, and I regret that he should think that I would waste time and postage in writing nonsense.

If, however, he sincerely expressed his thoughts and would care to verify what I wrote, I shall be very pleased to send him names and addresses of four witnesses who were present at the time the incident I referred to took place, and who will also be able to assure him that the lead-covered wires were absolutely clear of any switch-box or fitting from which there was any likelihood of any surface leakage, and had been so for nearly three months.

I must admit that I was myself puzzled at the time, and made every investigation, and also took precautions to draw the attention of others to the matter for future verification if necessary, and could only come to the conclusion already given.

J. Williams.

Whitehaven, *June 21st*, 1909.

With reference to the correspondence on this subject, I think I can give a satisfactory explanation of the phenomenon mentioned. It is an effect peculiar to paper-insulated cables, and is the result of a static charge in the cable; it is not only produced by lightning discharges, but it is also possible to charge a cable of this description by other means.

If Mr. Williams cares to prove the truth of this, there is a simple method of doing so, and one which works well with paper-insulated concentric cables. The method is, to disconnect the cables at both ends, leaving the concentric cores clear at the ends, so that there is no chance of a short-circuit between the cores; if a source of current is now connected to the end of a core and current applied to the cable for a few minutes and then cut off, the cable will be found to have retained a charge, which is easily proved by touching the core while standing on earth. A severe shock will be felt; it is generally possible to get two or three severe shocks in succession by touching the cable, and after this the cable becomes dead once more, and no shock is felt. A good way of trying this is to use a "megger" testing set to charge the cable. I have found this effect several times when testing cables.

In the case mentioned by Mr. Williams, the phenomenon was clearly due to a discharge of lightning causing an induced static charge in the cable, which was discharged to earth when the jointer touched the cable. The cables appear to act as a Leyden jar under these circumstances, the metals of the cable acting as the coatings of the jar and the paper insulation as the dielectric. I hope that these remarks will clear up the problem with which Mr. Williams has been faced.

Ajax.

Engineer's Department v. Accountant's Department.

What a scathing and caustic retort, "Accountant!" However, I emphasise the remarks in my last letter, and I might further add that the suggestions of the Institute of Municipal Treasurers and Accountants regarding the regulations for financial organisation and administration, contain, briefly, amongst other things, a desire to control the commercial department of the electrical supply undertaking; a desire for an enhanced position, at the expense of their brother officials.

However, to come back to the problem, I am aware that "Accountant" made reference to the Cr. side of the cash book, and if he will again refer to my letter he will see that I state that it is not usual for the cash book to be kept by the works department; surely "Accountant" will admit this, and as it is necessary to have a record of all invoices certified for payment before handing them over to the accountant's department, what simpler method could be adopted than to Dr. creditor's account when invoice was certified by chief official of department, and if not sanctioned by committee it could be dealt with as mentioned in my last letter. "Accountant" admits that this might certainly be done, but states that few accountants who know their business would keep their accounts in this manner; what would they do? Scratch the entry out, or pin a slip of paper in the ledger?

However, the question is a simple one, and if my remarks are wrong, will "Accountant" kindly inform me how, in the absence of a cash book, the matter should be dealt with? Like "Accountant," I am willing to learn, and, moreover, will esteem it a favour if he will show me how he would deal with the matter.

I notice "Accountant's" statement that he would not have replied had not "Interested" chuckled over the "howlers" of his accountancy friends; I might also state that I would not have replied to "Accountant's" criticism had the tone of his first letter not shown a deliberate endeavour to belittle the works staff, and such petty remarks regarding the wet towel, &c., are hardly what would be expected from an aspirant to the dignity of "The Financial Officer."

Quid Nunc.

Maintenance of Large Gas Engines.

Permit me to "hark back" to the discussion on the maintenance of large gas engines. I wish to make no contradictions, as I am too far away to enter into a controversy.

"W. C.'s" statement of £50 per annum paid to electricians for ignition upkeep of one 500-KW. set sounds to me like a libel on the Lodge system of ignition, or an admission of the electrician's incompetence. I have here gas engines of the Cockerill type, direct coupled to generators which develop 3,000 H.P., or 2,250 KW. The ignition gear for the whole of this plant is kept in a thoroughly good condition by *one Chinese electrician*. His wages are 9 cts. per hour, which is approximately £20 per annum.

Geo. W.-W.

Hong Kong, *May 22nd*, 1909.

Municipal Trading and the Electric Lighting Acts (Amendment) Bill.

I have pleasure in replying to your correspondent "Contractor," so far as his letter is capable of being dealt with. Much of it, however, is abusive, and has no real reference to my article.

"Contractor," in his first paragraph, confirms the conclusion arrived at in my article—namely, that the amendment was an attack on municipal trading, by which it was hoped to cripple municipal electricity schemes. He places himself and his friends in the forefront of anti-municipal campaigners, and so gives the game away.

The second paragraph is a blind fanatical rush at my article, and it has caused me much concern. I did think contractors could all read, but apparently this is not the case. At any rate, "Contractor" cannot read with understanding, or he would see that my contention was that a contractor is no worse off, except for the possible $1 per annum, when the municipal undertaker does wiring, than he would be in another and similar town where a company undertaker has a wiring department. This being the case, his second paragraph is so much labour lost, as it is based on several unwarranted assumptions; first, that a loss is usual on municipal wiring departments, equalling a penny rate, and others equally absurd. For instance, I did not say or think that a contractor's *total* loss is equal to his rate contribution. It is obvious that, given a certain amount of work to be done, the fewer the competing contractors, the higher the prices likely to be obtained. The whole point at issue, however, is whether a municipality shall be prohibited from doing certain work because some electric wiring contractors object, if it considers that by so doing, the general body of ratepayers will benefit. Some contractors seem to think that the municipal supply undertakings exist for the sole purpose of supporting their business, while, curiously enough, they do not look upon company undertakings in the same light. I contend that they are labouring under a delusion. It is for the ratepayers, through their representatives, to decide in each case, whether they will establish a department to enable them to wire their own houses, if they think fit, and not for two or three, or even for 100 wiring contractors to dictate (through the House of Lords) to the community.

Generally speaking, however, municipal wiring would never have been heard of if contractors had done their work fairly. The usual course is that a municipality starts electricity supply without a wiring department, and is forced into it by the shameful quality of work done by many contractors, and on urgent requests from consumers. That was the case here, at any rate.

Contractors tell me that competition is so keen amongst them that they cannot consider what is best for the consumer, because, if they do, another contractor will cut in on a cheaper scheme and take the business. We are, therefore, faced with the alternative of acting as consulting engineers to each installation, prohibiting work which is not done to our specification, or of establishing a municipal wiring department. I feel sure that, if any Bill is passed prohibiting municipal wiring departments, the result will be the passing of the Bill giving powers to all undertakers to register wiring contractors and wiremen, and to specify in detail the materials to be used.

With regard to "Electrical Contractor's" letter, this is dealt with in the replies given to "Contractor," except that I thank him for his courtesy, and am pleased to hear that my bread is buttered for me. I find the butter to be so thin that I should not have known it was there, unless the fact had been pointed out to me by "Electrical Contractor."

Borough Electrical Engineer.

Mining Switchgear.

It is quite evident to anyone connected with the supply of electricity in coal mines that some drastic changes in the methods of working are necessary.

Recent accidents point to the absolute unsuitability of direct or continuous-current supply, also D.C. motors, switchgear, fuses and other apparatus liable to sparking when making or breaking the circuit.

The nearest approach to absolute safety can only be secured by abolishing D.C. altogether, and with it all switchgear not immersed in oil, all fuses of any kind or description, and all junction boxes not filled up solid with insulation.

Make it compulsory to use only three-phase current, of any convenient voltage and periodicity, all phases insulated from earth, with a static leakage indicator permanently connected to each phase.

When any phase is earthed, the faulty section to be cut out of circuit, and not worked until it has been made good.

All cables to be made into ½ to 1 mile sections, with an oil-immersed loose-handle overload circuit-breaker at each section point.

All branch cables to have a separate oil-immersed overload loose-handle circuit-breaker at the nearest available point to the main cable.

All circuit-breakers to be so constructed that they cannot be wedged up to prevent opening on the overload setting.

All motors to be of the short-circuited rotor or squirrel-cage type.

All auto-transformers to be immersed in oil; on motors of less than 25 B.H.P. the auto-transformer is unnecessary.

All leads to motors to be entirely covered with damp-proof insulation.

Telephone communication from each circuit-breaker to the generating station.

Power.

Referring to Mr. C. Atherton Atchley's letter of June 9th, it seems to me that in designing mining switchgear with wire gauze ventilation windows, the question of protecting the windows from mechanical violence is not of such importance as would at first appear evident. The gauze windows, instead of being situated in the switch cover, and thus subject to exterior violence, could very well be located in the back plate on which the switch is mounted, so that when the switch is bolted in position, the wall or mounting on which it is held would form a natural protection to the windows, there being only a small space between the back of the switch and the wall. The effect of explosive violence from within would be eliminated by the ventilating action of the windows.

As Mr. P. N. Rand points out in last week's issue, one of the most serious difficulties to be coped with is the question of dust, but with the gauze windows placed vertically between the switch casing and the wall on which it is mounted, I do not think they would need more frequent attention than would be necessary for the other parts of the switch.

With reference to Messrs. A. Reyrolle's letter dated June 10th, while I am unable to agree that the construction of a switch with wire gauze ventilation is altogether out of court, I am, nevertheless, glad to see that this firm is giving attention to the design of switch boxes with long metal-to-metal machined joints, and there can be no doubt that if the close attention is given to detail and accuracy that is evident in their other productions, this system of protection will have the best possible chance of standing on its merits.

W. S. Burge.

Dundee, *June 19th*, 1909.

LEGAL.

HUMPHREYS *v.* THE NORTH-WESTERN ELECTRICITY AND POWER GAS CO.

THIS case was mentioned to Mr. Justice Channell in the King's Bench Division on Saturday.

MR. J. D. CRAWFORD, for the plaintiff, said the defendants had consented to judgment for the full amount claimed and costs. Counsel then handed up a written consent and asked for judgment accordingly.

MR. JUSTICE CHANNELL, however, pointed out that consent to judgment could only be given in Court by counsel. Occasionally he allowed consent to be proven, but that was rather going behind what used to be the rule.

Acting on this suggestion, COUNSEL called plaintiff's solicitor to prove the consent, and judgment was given accordingly.

BRITISH WESTINGHOUSE ELECTRIC AND MANUFACTURING CO., LTD., *v.* BRAULIK.

ON Tuesday last this action, which related to patents for electric arc lamps, was opened before Mr. Justice Joyce, in the Chancery Division of the High Court. The plaintiffs were represented by Mr. Walter, K.C., and Mr. A. C. L. Russell-Clarke, instructed by Messrs. Faithful & Owen, and the defendant by Mr. Bousfield, K.C., and Mr. Gray, instructed by Messrs. Osborn & Osborn.

In opening the case, MR. WALTER said that the action was brought to restrain an alleged infringement of letters patent No. 18,786 of the year 1902, which related to an invention for improvements in arc lamps. This was an invention relating to the regulation of the arc by mechanical means. If the carbons were kept in a fixed place the arc would go out when once they were burnt away sufficiently to prevent the current from crossing. With ordinary carbons this was bad enough, because they were not of an even consistency all through, but recently there had been a greater variation in the carbons owing to the flame arc lamps that were now very largely used. For those lamps, which gave a very intense yellow light, metallic salts were introduced into the carbon, and the introduction of those salts caused a still further variation in the character of the carbon points, and consequently still further fluctuations in the relative distance of the carbons. This, of course, caused still further difficulty in the regulation of an arc lamp. First of all there was an arrangement by which the carbon slid down against a fixed stop. Then devices were made by which the carbons were fed down equally. The invention in question related to an arc lamp having downwardly pointed inclined carbons, and it further related to downwardly pointed inclined carbons which did not slip, but which were clipped at the top firmly. It also had this further limitation, that it related to that class of lamp in which the carbons were simultaneously lowered. Practically three-quarters of the flame arc lamps that were in use at the present day used this invention.

MR. JUSTICE JOYCE: Is it your invention?

MR. WALTER: Yes. With this invention, he said, as the carbons were allowed to come down they simultaneously came together. To strike the arc they had a bar or lever acted on by an electric magnet. That brought the carbons apart from one another. They could move both, but it was more convenient to move one, and that was generally done. The invention in question related to this—on to these downwardly inclined carbons that were simultaneously fed they introduced a regulating movement that moved the carbons forward and backward. The arc was consistently varied in accordance with the electric conditions, while the carbons were held at the two top points, so as to move properly. The carbons were governed by the actual physical conditions that existed at the time. With this invention they had mechanism for giving the downward or feeding movement connected with mechanism for giving the internal direction of the arc, so that it prevented the carbons coming down while the sideways movement was in operation. That was the invention, and it turned out to be a very important one as applied in the modern system of flame arc lamps. Counsel proceeded to deal in detail with the specification, and went on to the bench to explain the working of the invention to the Judge with the aid of a model.

MR. JUSTICE JOYCE: But is your invention an invention of principle, or what?

MR. WALTER said their claim was not for principle, but for a combination of parts. It was confined to lamps with downwardly pointed electrodes inclined towards each other. It was confined also to lamps that had a power feed mechanism by which the electrodes were lowered simultaneously through the same distance, and where the carbons had a swing movement in accordance with the resistance to the current. That was brought about by the lever. It was still further confined to lamps where the horizontal movement took place before the downward feed mechanism was allowed to operate. The defendant had taken every part of the invention.

MR. BOUSFIELD said that the question of infringement did come into the case, but the more serious questions would be anticipation and subject matter.

(To be continued.)

THE KING *v.* JUSTICES OF DEVONPORT AND OTHERS.

THIS case came before a Divisional Court, consisting of the Lord Chief Justice and Justices Jelf and A. T. Lawrence, on June 14th and 15th, when Mr. Danckwerts, K.C., appeared on behalf of the Town Clerk and Coporation of Devonport, to show cause why a writ of prohibition should not be made absolute prohibiting them from proceeding with, and the magistrates of the borough from hearing and deciding, certain summonses and informations which had been laid against the Devonport and District Tramway Co. to recover certain penalties.

The rule *nisi* was granted by the Court on April 22nd last, and it was then stated that the Tramway Co. were authorised by an Act of 1893 to construct certain tramways in Devonport, and by an Act of 1902 the Corporation were also authorised to make tramways in other portions of the borough. An agreement was entered into by which the company agreed to lease the Corporation tramways, and covenanted to run a reasonable service of cars or pay a penalty of £2 a day. They also agreed to run a service of workmen's cars at reasonable hours, or pay a penalty. The Corporation in April last issued summonses against the company to recover certain penalties, and the company then applied for a rule prohibiting the same upon the ground that the company could not be summoned under the Summary Jurisdiction Act, and that the penalties were only recoverable by arbitration.

MR. DANCKWERTS said that the facts were these: The company, finding their financial position was such that they could no longer run the Corporation tramcars, gave the Corporation notice to that effect, stating that on a certain date they would stop the service. The Corporation refused to accept that notice, but the company ceased running the cars. He pointed out that the company had covenanted to run a reasonable service to meet the public wants, and the lease said that any matter of disagreement should be determined by arbitration by the Board of Trade.

THE LORD CHIEF JUSTICE: The ordinary service, not the workmen's cars?

MR. DANCKWERTS said that was so. There was also another clause which compelled the company to run workmen's cars at certain hours, and if they did not do so, penalties could be recovered, so the Corporation said, under the Summary Jurisdiction Act. Before the summonses were returnable, the company obtained a rule *nisi* for a prohibition on the grounds (1) that the penalties were not recoverable summarily; (2) that there was an arbitration clause; and (3) that the Corporation having re-entered, none of those grounds had any foundation. The Corporation had been extremely careful to see if there was a dispute within the meaning

of the agreement, and had applied to the Board of Trade, who refused to entertain the matter, because they said there was no dispute. The company said that Sec. 13 of the Act of 1902 did not apply, but he submitted that that was a wrong contention. The question of re-entry was quite outside the matter, because before anybody was entitled to re-enter, notice must be given, while Sec. 11 of the agreement precluded almost every possible cause for re-entry.

Mr. Simon, K.C., for the company, argued that there was a substantial difference for the arbitrators to determine, and the Magistrates could not enforce the penalties until the difference had been determined by arbitration. The Magistrates were not the tribunal to determine the differences between the parties, and their jurisdiction was merely to enforce the penalties when the differences had been determined, and it had been decided that penalties had been incurred. He submitted that as matters stood the jurisdiction of the Magistrates was ousted. The fact that the tramway system under the company's control did not pay was sufficient to warrant the company in saying that they would not run the cars any longer. That created a difficulty which called for settlement by arbitration.

In the result their Lordships discharged the rule, and refused the Tramway Co.'s application for a prohibition.

Porte *v.* Verity's, Ltd.

In the King's Bench Division, Dublin, on 16th inst., before Mr. Justice Madden (and Mr. Justice Boyd, Mr. Corvan applied, on behalf of the defendants, for an order setting aside an order of the Court, dated April 1st last, the writ of summons, and all the subsequent proceedings in the action on the ground that the contract sued upon was made in England, and out of the jurisdiction, or in the alternative directing that all further proceedings in the action be stayed, and that the matters in dispute be referred to arbitration, pursuant to a clause in the contract. Counsel moved on the affidavit of Mr. M. B. Cotterell, a director of the defendant company. The contract related to the standards and poles erected for the Corporation in the city of Dublin in connection with the electric light supply, and the question at issue appeared to turn mainly upon the correspondence between the parties.

Mr. Hanna, with whom was Mr. Gordon, K.C., M.P., opposed the application on behalf of the plaintiff.

According to the *Dublin Daily Express*, the Court, regarding the contract as an Irish one, made an order staying the proceedings, and referring the matter to arbitration, costs to be costs in the action.

Blackpool Tramroad Appeal Case.

The Blackpool and Fleetwood Tramroad Co., at the Preston Quarter Sessions on the 15th inst., appealed against the improvement rate levied on them by the Fleetwood U.D.C. and the Fleetwood Improvement Commissioners.

Mr. Sutton, for respondents, took a preliminary objection, urging that the appeal could not go forward, as notice had been given out of time. The Act under which the rate was levied laid it down that, if the parties desired to appeal, it must be at the next general or quarter sessions, and there had been several quarter sessions since the rate was levied, in June, 1908.

The Bench upheld the objection, and there was no order as to costs.

E. Brook, Ltd., *v.* Newtons, Ltd.

In this case heard recently at the Huddersfield County Court, plaintiffs sued for £40 odd, the balance of account on the sale of four motors between October 6th, 1908, and March 8th, 1909. Defendants admitted plaintiffs' claim, but counter-claimed for £34 16s. 6d. for defects in one motor, and paid £5 6s. 6d. into Court. The counter-claim was, therefore, the only matter for trial.

Musgrave & Sons, Ltd., *v.* The Bradford Corporation.

In the King's Bench Division, on Thursday, June 17th, Mr. Justice Darling commenced the hearing of an action brought by Messrs. John Musgrave & Sons, Ltd., of the Globe Iron Works, Bolton, Lancashire, engineers and makers of electrical generating plant, against the Mayor and Corporation of Bradford, to recover a balance of £1,200 0s. 10d., which plaintiffs declared was due on the price of machinery supplied to the Bradford electric lighting and traction station. The defendants denied their liability, declaring that plaintiffs had failed to carry out the terms of the contract, and consequently they were not entitled to payment. Further, they counter-claimed the sum of £1,996 6s. 4d., in respect of damages sustained, and a declaration that plaintiffs should maintain the machinery as provided in the contract until 12 months after their electrical engineer should have given his certificate of satisfaction. Plaintiffs, in answer, denied that the certificate of the engineer was a condition precedent, or that any damages were suffered.

Mr. Walter, K.C., with Mr. Disturnal, appeared for the plaintiff company, and Sir A. Cripps, with Mr. Hutchinson, was counsel for the defence.

Mr. Walter, K.C., opening the case for the plaintiffs, explained that in January, 1903, the plaintiffs supplied the Bradford Corporation with a steam dynamo capable of developing 1,000 kw. for lighting and traction purposes. The engine was of the low-speed inverted-vertical-compound-condensing type, driving direct an electric generator at 85 r.p.m. The dynamo, which was constructed in this case for Messrs. Musgrave by the British Westinghouse Co., was a compound-wound direct-current machine of 480 to 520 volts. The armature revolved on the engine shaft, and the way it was fitted was of considerable importance to the case. The boss of the spider was drilled out slightly smaller than the size of shaft, and the spider was then forced out of the shaft with hydraulic pressure of some 200 tons. There was a flange on the boss of the fly-wheel corresponding to a flange on the boss of the armature spider. Both fly-wheel and armature were keyed up, and the two flanges which met were bolted together with a series of bolts. This was the practice at the time the engine was supplied to the Bradford Corporation, but since then it had been found that these bolts were unnecessary, as engines of this type ran quite as efficiently and safely without them. The fly-wheel of this engine weighed some 50 tons, and the armature 20 tons. The shaft in the centre was some 20 in. in diameter and the bearing 36 in. long. This engine was installed and was running quite satisfactorily at the defendants' station, but in 1904 they ordered another machine, which was to be an exact duplicate of it in every respect. It was agreed as part of the contract that 85 per cent. of the cost of the engine (£7,999) was to be paid on delivery, subject to the Corporation's engineer giving his certificate that the machine was conformable with the terms of the contract, and the remaining 15 per cent. was to be paid at the expiration of 12 calendar months after the installation, provided that the engine worked to the satisfaction of the defendants' engineer, "and not otherwise, and his written certificate obtained to that effect." The order was placed on January 8th, 1904, and certain deviations from the previous contract were agreed upon—viz., that the shaft should have a diameter of 23 in. instead of 22, the crank pins should be 14 in. × 12 in. long instead of 14 in. × 9½ in., and the crankshaft bearings 40 in. × 20 in. instead of 36 in. × 18 in. There were also other minor alterations. On May 30th, 1905, the engine was installed, and underwent 12 hours' run, and 85 per cent. of the purchase price was paid. It passed its overload tests quite satisfactorily, but it was during the remainder of the 12 months before the last 15 per cent. was secured, that the disputes arose. The engine on occasions smashed certain of the bolts which connected the flanges of the fly-wheel and armature together. The defendants declared that the engine was faulty, and tried every conceivable means to make it break down by overload, &c., but did not succeed. The engineer to the Corporation declared that the shaft was weak and refused to give his certificate. The result was that the engine was dismantled and the shaft taken out, and it was then found that there were signs in the armature of heavy short-circuiting having taken place which probably caused the smashing of the bolts. He would call expert evidence to show that the shaft was perfectly good for the purpose for which it was intended. They were still awaiting the engineer's certificate, and they had had to bring the present action to recover the balance. They declared that the engineer was the servant and agent of the defendants, and though he was quite satisfied with the engine, yet at the instigation of the defendants and in collusion with them for the purpose of obtaining plaintiffs' consent and undertaking to bear certain obligations, he had wrongfully failed to certify in writing that he was satisfied with the engine.

Sir Alfred Cripps raised the point that the certificate of the engineer was a condition precedent, and that plaintiffs had no right to bring their action to recover the balance until they had obtained that certificate.

Mr. Justice Darling said that that objection would be fatal to the plaintiffs' case, but for one thing. Plaintiffs declared that the certificate had been improperly withheld, and that the engineer had been induced to withhold it at the instigation of the Corporation.

Sir Alfred Cripps said that his Lordship should try this issue first, and it was agreed to do so.

Mr. Frank Musgrave, director of the plaintiff company, was then called and corroborated counsel's history of the facts leading up to the present action. On March 23rd, 1906, the Corporation's electrical engineer told him that he had come to the conclusion that the breaking of the bolts was caused by the weakness of the shaft. Witness pointed out that other engines of the same type and size of shaft made by his firm had been running for years, and further, that the breaking of the bolts was not in any way detrimental to the running of the engine. In the following August witness interviewed the chairman of the Bradford Electricity Committee as well as Mr. Blackman. They again told him that the shaft was weak, and the chairman said that if the Corporation did not get a further guarantee plaintiffs would not be paid. The chairman further said that whether the shaft were right or wrong the Corporation were determined to have a larger shaft put into the engine. The shaft was afterwards dismantled, and he had examined it carefully, but had absolutely failed to discover any flaw in it.

Cross-examined, Witness said that the shaft had been made at the Darlington forge and was of the Siemens-Martin acid open hearth steel.

Mr. Robinson, chairman of the Bradford Electricity Committee, was then called for the other side, and said that his whole object in the interview with Mr. Musgrave was in order to try and come to terms with the plaintiffs over the matter. He offered to advise his committee to pay the balance if Messrs. Musgrave would guarantee to make the engine run for 12 months without a bolt breaking.

Cross-examined, Witness denied that it was through any suggestion of his that the engine was tested in order to develop any latent defects before the guarantee period had expired. In 1904, the

spider of one of the Morley engines broke, and later the shaft went also. The Corporation paid for the renewal of the Morley engine shaft. Witness denied that he in any way attempted to influence Mr. Blackman, the Corporation's engineer, in the matter.

Mr. Walter then called Mr. H. F. Parshall, M.Inst.C.E. Witness said he had examined the history of this engine, and he had come to the conclusion that the breaking of the bolts was due to improper assembling of the machine.

Mr. Walter: What would be the effect of a short-circuit upon the shaft to which the armature was fixed?—Witness replied that a heavy short-circuit would have the effect of stopping the rotation of the engine. Machines of the class in question, if they were correctly assembled, would not be greatly affected by short-circuit, but if not accurately put together, one of the effects of short-circuiting would be to break the bolts.

Witness, continuing, stated that had the bolts been fitted quite true, nothing would have happened to them if a short occurred. There had been no breakage with the other engine, and the two machines were identical, so that there must have been a difference in assembling. It was not an unusual thing, however, for the bolts to break, and the best remedy was to leave them off altogether. It was always done in modern practice, because it was admitted that they could not bring the surfaces of the flanges together, with such accuracy as to obtain any benefit from that form of construction. These parts of the machine were fitted together under enormous hydraulic pressure, and could be run perfectly safely without bolts. As an instance, six similar machines were laid down in the Dublin tramway station, and as far as was humanly possible, they were identical. Five of them assembled accurately, but the sixth did not, and the bolts smashed. They simply took the bolts out, and the machine was still running quite safely.

Cross-examined, Witness said that in the case of a short-circuit a machine of this kind might stand considerably over its normal strain, but it could not be safely expected to stand more than twice its normal strain.

The defendants then called Mr. Blackman, M.I.E.E., formerly the electrical engineer for the city of Bradford. Witness said there was a circuit-breaker on the machine in question which acted at approximately 1,500 kw. This circuit-breaker was for the purpose of protecting the engine when a short-circuit occurred. As engineer when the machine in question was laid down, he always acted on his own initiative, and absolutely denied that he was in any way influenced by the Corporation or the Electricity Committee in using his own discretion over the contract. He thought the elastic limit of the shaft was too low. He did not refuse his certificate simply because he wanted a larger shaft. He did not care whether the shaft was larger or not so long as the engine ran satisfactorily.

Cross-examined, Witness said he did not know whether the elastic limit was introduced into the specification or not, nor did he think it was usual to put it into any modern specification; none the less, it was of great importance.

Further cross-examined, Witness denied that the engine had been subjected to "heavy short-circuiting." When he became dissatisfied with the shaft, he fixed an electric bell test to see if it sagged sufficiently to ring the bells. It was true that this test was applied for a long time, but the bells never rang.

Cross-examined as to overload, Witness denied that the machine was overloaded for any length of time.

His Lordship then proceeded, with the consent of both parties, to give his judgment on the point raised by Sir A. Cripps as to the refusal of the certificate and the alleged collusion between the engineer and the Corporation. Although he came to the conclusion that Mr. Blackman was not satisfied, and thought the engine ought to have another shaft, he held that that gentleman was unreasonable in forming such an opinion, because they had had it proved that it was not unusual for the bolts to break in these machines, and that even if they did, the engines were quite as safe and efficient without them. His Lordship was of opinion that Mr. Blackman did refuse the certificate for the purpose of obtaining an obligation from plaintiffs, to which he was not entitled under the agreement, but he thought he tried to do so because he was not satisfied with the engine, although he ought to have been. Therefore, he found that the engineer did not act at the instigation of the defendants, and that there was no collusion. Although it was a wrong one, the engineer formed his own honest conclusion on the matter. He did not, as alleged by the plaintiffs, wrongfully fail to certify upon these findings, therefore, plaintiffs were dispossessed of their claim, and he would give judgment for the defendants upon that claim.

His Lordship then proceeded to hear the case for the defendants' counterclaim.

Sir Alfred Cripps, opening the counterclaim, stated that defendants based their case on the efficiency of the shaft. This shaft had been submitted to the highest expert in the country, and he hoped to be able to show beyond doubt that it was improperly annealed, that its elasticity was about half what it should have been, and that it was not suitable for the work it had to do.

Evidence was then called.

Prof. John Oliver Arnold said that in January, 1907, he received a package of steel drillings from Prof. Goodman, of the Leeds University, which he was given to understand came from the engine in question. They were acid steel rather high in phosphorus. Later he received a piece of the shaft in question from the town clerk of Bradford for examination. As a result of his tests, he was struck with the astoundingly low elastic limit of the material. For steel of this kind the elastic limit should have been at least twice as great as it was in the sample submitted to him. There was nothing seriously the matter with the composition of the steel of the shaft; its chief fault was that it had been over annealed, and this might have been remedied by what they called the process of normalising, or by heating up the shaft again and allowing it to cool by air. This would not have been an expensive matter.

Cross-examined, Witness said that in a case like this he did not think that the workmen who turned out the shafts would be able to judge the temperature of the steel. The piece of shafting in question he found on examination to be full of ghost lines.

Cross-examination continued: With regard to the alternating stress tests, he subjected the steel to tension and compression, and found that 150 bends would break it.

Mr. H. R. Burstall, consulting engineer, called in by the Corporation of Bradford to consider and advise upon the shaft, said that the shaft was either of soft material or flawed. On making tests, he found that the elastic limit of the steel was abnormally low. The result was that there was such a deflection as to throw a load on the bolts for which they were not designed. With a rigid shaft such a load would not be thrown on the bolts.

William Jones, works superintendent at the electricity works of the Bradford Corporation, gave evidence as to the taking of sectional strips from the shaft for testing purposes.

This concluded the evidence on the Corporation's counterclaim.

Mr. Walter, on behalf of Messrs. Musgrave, said that the breaking of the bolts had nothing to do with the shaft. When the armature, which was to be placed by the makers of it on the main shaft of the engine, arrived at the works, it was found that the spider was untrue to the extent of $\frac{1}{1000}$ of an in. on the side away from the keyway, and it was then scraped and filed by the Westinghouse people on the inside in order to get it, as far as they could by hand, true. The shaft was of the ordinary quality of shafts of this description, and amply sufficient to discharge the work cast upon it. When it was received it had nothing whatever the matter with it, and would have gone on doing its work if it had never been touched. Under these circumstances, his clients ought not to be saddled with the cost of the Corporation's experiments in putting in a larger shaft.

Mr. Yates, engineer in the employ of the plaintiffs and engaged at the Bradford electricity works in the erection of the engine, said the armature on arrival at the works had not been properly boxed, and he saw the Westinghouse people scraping and filing in an attempt to get it true.

Mr. Putnam, managing director of the Darlington Forge Co., the manufacturers of the shaft in question, said it was made of hematite pig-iron, and the process of annealing was precisely the same as that applied to all shafts for many years past. In this particular case the temperature of the furnace was taken every week, and he was convinced the shaft was not over annealed. The shaft was tested by his firm after it had been annealed. It stood an ultimate tensile stress of 29 tons, and went through a bending test of 180° without fracture. The result of a ductility test was 38 per cent. elongation in two inches. If it had been over annealed it would not have stood that test. The shaft was turned down to rough dimensions, and was bored with a 5-in. hole right through the centre. If there had been any latent defects, they would have been made apparent. He had examined the test pieces and had not found the slightest traces of ghost lines.

Mr. Reginald Stanzer, M.Inst.C.E., stated that he tested the steel for the shaft in question, and was of opinion that it was perfectly satisfactory for the purpose desired.

Mr. Fred Pickford, M.Sc. (Eng.), stated that the plaintiffs sent him two pieces of steel for testing. He found that the yield point was 14·4 tons, and the ultimate stress about 23·3 tons. He noticed no indications of over annealing. As regards bending, it was a piece of steel of ordinary quality.

Mr. William Donaldson and Mr. Harding, M.Inst.C.E., also testified to the good quality of the steel.

Mr. Justice Darling, in giving judgment, said that the defendants had not established to his satisfaction that the shaft was defective in quality or improperly manufactured, or that it was not made of steel which could have been made into a proper shaft but for the over-annealing, or that it was not then fit for the work. He therefore found it impossible to say that the defendants had made out their case on that point. But upon the claim for the price of the broken bolts, he held that the breakage was caused by the non-fitting of the flanges of the armature and fly-wheel, which were bolted together by the plaintiffs. He held that the plaintiffs, knowing that the surfaces were untrue, should not have bolted them together, but should have waited until the Westinghouse people had made them true. He therefore found for the defendants on that point, and hoped they could agree on the amount, which could not be a very large one.

Sir A. Cripps said defendants were willing to accept £10.

Mr. Walter agreed to that, and his Lordship, therefore, gave judgment for the defendants on the claim and counterclaim for £10, with the general costs of the case.

County of Durham Electrical Power Distribution Co., Ltd., v. Commissioners of Inland Revenue.

In the Court of Appeal, consisting of the Master of the Rolls and Lords Justices Farwell and Kennedy, on Tuesday last, the hearing was concluded of this case upon the company's appeal from a decision of Mr. Justice Channell upon a case stated by the Commissioners of Inland Revenue.

It appeared that on August 3rd, 1907, an instrument dated August 1st, 1907, was presented on behalf of the company by their solicitors to the Commissioners for their opinion as to the duty with which the instrument was chargeable. The instrument set out that Snowball, Son & Co. were to take for seven years from

the date of the instrument all electric current used for motive power, heating and lighting, on the consumers' premises for which the consumers were to pay a fixed charge of £57 10s. per quarter, and, in addition, 1d. per Board of Trade unit for all current supplied and consumed as indicated by the company's meters, and 10s. per quarter as a rental for the meters. By Clause 5 of the agreement the consumers were to be entitled to a supply of electric current up to the capacity of the existing installation, which was to be deemed equal to 46 KW., and Clauses 6 and 7 provided for the increase of the quarterly payments on decrease of capacity of the existing installation, with a proviso that in no case should the said fixed charges £57 10s. be reduced below £50 per quarter. The Commissioners held that the instrument was an agreement or memorandum relating to the sale of goods, wares or merchandise within Exemption 3 under the head in the schedule to the Stamp Act, "agreement or any memorandum of agreement," but in the circumstances they held that duty was payable at the rate of 2s. 6d. per £100 of the aggregate amount of the minimum annual payments for seven years. The company's contention was that no *ad valorem* or other duty was payable, and the question for the Court was whether the assessment was correct. Mr. Justice Channell held that the assessment of the Commissioners was correct, and gave judgment for the Crown. Hence the present appeal of the company.

Mr. Danckwerts, K.C., and Mr. Tomlin appeared for the appellants, and the Solicitor-General and Mr. Finlay for the Crown.

At the conclusion of the arguments their Lordships dismissed the appeal.

THE ELECTRO-PEAT COAL CO. APPEAL.

AN appeal has been lodged by the plaintiff in the action of Baker *v.* The Earl of Mayo, and on Saturday last Mr. Jno. Macgregor, one of the defendants, applied to Lords Justices Vaughan Williams and Buckley, for security for costs. The action was brought against the Earl of Mayo, Mr. H. Howard Allen, Mr. J. Macgregor, Colonel St. Quintin, Sir Leslie Falkiner, and Mr. Geo. Darlington Simpson, the plaintiff claiming damages in respect of alleged misrepresentation in connection with the Electro-Peat Coal Co. Upon the findings of a jury, Mr. Justice Lawrence entered judgment in favour of all the defendants, with the exception of Simpson, against whom judgment was entered for £910, with costs.

MR. EAMES, in support of the application, stated that Mr. Macgregor's costs had been taxed at £1,060, which the plaintiffs had not paid, and they had not paid the taxed costs of several of the other defendants. As it was understood that similar applications would be made by other defendants, it was agreed that the present application should stand over so that all might be dealt with altogether.

MUNICIPAL FINANCE.

WE recently received from Mr. H. Faraday Proctor, city electrical engineer, Bristol, and hon. sec. of the I.M.E.A., the following communication on "Financial Organisation and Administration":—

Considerable interest will be felt as to the conclusions come to at the forthcoming meeting of the Institute of Municipal Treasurers and Accountants in relation to the above matter.

It is a very open secret that a set of Regulations has been drawn up under the auspices of the above-named Institute, and that some wicked persons have given a degree of publicity to the same, which was scarcely desired by the originators at this stage.

To fully appreciate the effect of the proposals and the importance of the financial officers who are responsible for the drafting of the same, the rules should not have been written in the third person. If each treasurer or accountant to a municipality would undertake to circularise these draft Regulations amongst the different Committees and his brother officers—after having them reprinted in the first person, inserting his own name wherever necessary—general opinion would be speedily obtained, although it is feared that the said officer would scarcely feel gratified at the results from a personal point of view.

A few of the Regulations would then read as follows:—

I AM THE "FINANCIAL OFFICER."

Separate annual estimates of capital and revenue accounts shall be submitted to MY COMMITTEE by every Committee of the Council in such form, and under separate headings, as MY COMMITTEE may prescribe. The preparation of the estimate shall be by the various heads of departments in consultation with ME.

I shall present the draft estimates to the various committees for approval, and furnish MY COMMITTEE with a copy thereof.

I shall bring up to MY COMMITTEE the annual estimates approved by the various committees.

In considering the capital estimates, MY COMMITTEE shall have regard to the maximum amount which, *in* THEIR *opinion*, the Council should seek to borrow in the year.

No liability exceeding £50 shall be incurred (by any committee) without the express sanction of the Council, except in the case of committees acting in pursuance of statutory or specially delegated powers of expenditure.

It shall not be in order to submit estimates to the Council through any committee other than MY COMMITTEE, except in cases of urgency or where the Council is under statutory obligations to proceed.

No recommendation or proposal involving expenditure on capital account shall be submitted to the Council, until an estimate is submitted by MY COMMITTEE to the Council.

THE HEADS OF DEPARTMENTS SHALL SUBMIT TO ME the Contractors' detailed account and measure bill for MY examination and comparison with the contract, specifications and bills of quantities, also a statement showing the additions and deductions on the contract (if any), and the final certificate of the heads of departments, or architect, as the case may be, is not to be issued until this has been done.

THE HEADS OF DEPARTMENTS SHALL FURNISH ME WITH PARTICULARS OF ALL ESTIMATES AND TENDERS.

The whole of the account-keeping relating to stocks and stores, works accounts and cost accounts, shall be under MY SUPERVISION AND CONTROL, and all statements of costs shall be compiled by and issued from MY department.

The Accounts of all Committees shall be submitted BY ME to MY COMMITTEE for examination and recommendation to the Council for payment.

MY COMMITTEE shall settle disputed accounts for goods supplied, work done or charges made.

No proposal dealing with new or existing sources of revenue shall be submitted to the Council until a report on the financial bearings of the proposal is submitted by MY COMMITTEE.

I shall at all times make any suggestions which may occur to ME as likely to effect economy without impairing efficiency.

I shall attend all or any of the Committees of the Council as may be required.

Considered in this form, one can readily appreciate the desire for secrecy until such time as the Treasurer representing Finance could present himself in all his glory to receive the adoration and homage of the Heads of the minor departments representing Law, Order, Light, Learning, &c.

It is difficult to find the link connecting the various Committees and the Heads of Departments, since the Heads of Departments have to submit particulars of their estimates and tenders, contractors' detailed accounts and measure bills to the great EGO, and the great EGO in turn presents the draft estimates to the various Committees for approval.

It is not in order for any Committee other than the Finance Committee to submit to the Council estimates or any recommendation or proposal involving expenditure of Capital Account. Since the Chief Officers do not submit particulars to their Committees, and the Committees may not submit a proposal to the Council, why have Committees. Could not the great EGO do it all?

It is really almost impossible to conceive that any strong men would allow themselves to form part of a Committee having such restricted powers as the financial officers propose.

It is apparent that the human element has been ignored in drawing up the regulations. Whilst it cannot be supposed for a moment that the heads of all great trading departments (to say nothing of the other officers) would allow the control of their departments to be taken out of their hands, or consent to be under the obligation to submit all their estimates and proposals to another officer, it needs no very strong imagination to picture the lively time the poor financial officer would have under such conditions in collecting and retailing information regarding the various technical departments with the assistance, or otherwise, of their respective managers.

PARLIAMENTARY.

Bury Tramways.

ON June 16th, the Select Committee of the House of Commons, presided over by Mr. Charles Nicholson, commenced the consideration of the Heywood and Bury Corporation Bills. Both the measures relate to the running of tramcars in the districts of Bury, Rochdale and Heywood. The Bury Corporation were opposing the Bill of the Heywood Corporation, who had a petition against the Bury Corporation's Bill.

MR. H. LLOYD, K.C., with whom appeared Mr. Hutchinson, in explaining the provisions of the Bill, dealt at length with the negotiations which had taken place between the three Corporations for the running of the tramways. Various suggestions had been made, and one of them was that each town should work the tramways so far as lay within their own district. They had not, however, been able to come to a mutual understanding, and therefore they came to Parliament to see what could be done. The Heywood Corporation, in their Bill, now proposed that the line should be worked by the respective Corporations from Market Place to Market Place. That was, the Heywood Corporation would work the line from their Market Place to the Market Place of Bury and Rochdale, both of which Corporations would have the same power of running to the Market Place of Heywood. The Rochdale Corporation were supporting the promoters' proposals. The Heywood Corporation proposed that the terms should be that each Corporation should take the profits made in the cars whilst running within their boundary, and should pay to the operator the working expenses. The Bury Corporation, however, opposed those proposals, and they put forward a scheme in their

Bill by which the Corporation wanted to run the cars from their market place through Heywood to Rochdale.

Mr. C. C. Bouchier, town clerk, gave formal evidence.

Mr. Salter, electrical engineer, said that he thought that if the Bury Corporation were allowed to run tramcars over the Heywood Corporation lines it would cause serious dislocation to the traffic. The Corporation already worked under an agreement whereby the cars ran from market place to market place of the respective local authorities. That agreement was terminable by six months' notice. They were at present dividing the profits and expenses on the yardage basis. By that system of working the Bury Corporation got the biggest share of the profits, and in three years it had made a difference of £1,100. It was desirable that a tramway should be controlled from a centre as represented by the hands of its owners. He was conversant with the clauses in the Bill, and there was nothing in them which was not in accordance with established practice. As Parliament had authorised the Heywood Corporation to construct and run tramcars, he did not think it right that these powers should be taken away at the instance of Bury.

The Witness, in cross-examination by Mr. Ram, K.C., for the Bury Corporation, said that he considered the Corporation had treated Heywood intolerably. He had been an advocate of through running. So far as the distance between Rochdale and Bury was concerned, there was no difficulty in through running. They had, however, to remember local circumstances.

On June 17th Mr. Salter, re-examined, said that he never knew an instance where Parliament had granted compulsory powers to one authority to run through another's territory, so as to get to another district. That was what Bury wanted. They wished to go across Heywood, so as to get to Rochdale. He complained that Bury in the past had always tried to override Heywood.

Mr. S. Sellon, electrical engineer, giving evidence, said he thought the proper principle on which to have through running powers was by mutual arrangements. The tramcars should run from the centre of one town to the centre of the other, and not through a whole district. If cars were run from one district to another outside an intervening area, he considered that the centre authority was the proper one to provide the cars. Bury proposed if they exercised their powers of through running past Heywood into Rochdale that they should be able to fix their own fares in Heywood and Rochdale, provided that they did exceed the statutory maximum. He did not agree with that proposal, as it meant that Bury could charge any fare they liked, and that might cause undue competition and cutting of fares with Heywood. There was no provision in Bury's Bill, as there was in Heywood's proposal, for reciprocal powers. He thought the scheme of the Heywood Corporation was a complete one, whereas the Bury Bill appeared to ignore the existence of Heywood.

Mr. J. B. Hamilton and Mr. A. A. Day, electrical engineers to the Bolton Corporation tramways, gave similar evidence in support of the Bill.

The Committee then proceeded to deal with the proposals of Bury Corporation.

Mr. William Clough, general manager of the Bury Corporation tramways, said that under their Bill his Corporation asked for powers to run the cars right through Heywood to Rochdale. If the Bill promoted by Heywood passed they would have two services terminating in Heywood Market Place, and that would lead to passengers' confusion and public inconvenience. The result of having a through service would be that the receipts on their line would go up.

The Committee adjourned.

Liverpool Tramways.—A Select Committee of the House of Commons, presided over by Mr. Mooney, considered the Liverpool Corporation Bill on June 15th and 16th. Under the Bill the Corporation seek to spend £30,000 on street widenings and £100,100 on the construction of new tramways and the equipment of the same. The only opposition was that of the L. & N.W. Railway to the proposed tramway from Holland Place to Broad Green Road. Mr. C. W. Malline, general manager of the Corporation tramways, gave evidence in support of the Bill, and said that the opposed route would relieve the great congestion now prevailing on the Old Swan and Knotty Ash route. Sir Charles Petrie (chairman of the Tramway Committee) also gave evidence. The evidence of the opposition was to the effect that the line they opposed could not pay. The Committee passed the preamble of the Bill and ordered it to be reported for third reading.

L.C.C. Tramways Bill.—Reporting on this Bill, Sir Geo. Doughty's Committee states that the seven years allowed for the construction of the authorised tramways are in excess of the period allowed by standing orders, but that as they are most dependent on street improvements, this period should be allowed.

The Buenos Ayres Exhibition.—As already stated in our pages, a great Exhibition of Railways and Land Transport is to be held at Buenos Ayres next year to celebrate the first centenary of Argentine independence. An extension of time for sending in applications for space is announced by the Executive Committee. Such applications must be received in Buenos Ayres by September 10th, or by delegates abroad a month earlier.

BUSINESS NOTES.

Electricity at the Church Pageant.—On the occasion of the English Church Pageant at Fulham Palace, Messrs. Oliver, Clark & Co., Ltd., of Goldhawk Road, W., carried out the electrical installation work, which included 10 searchlights to illuminate the grounds for the evening performance. They also fitted 25 arc lamps of the 12-ampere type, made by the Beck Flame Arc Lamp Co., of Hayes; 1,200 incandescent lamps of 100, 50, 32 and 22 c.p. each were fitted in different parts of the grounds; all were metallic-filament lamps, made by the "Z" Lamp Co., and supplied by Messrs. Veritys, Ltd. The whole of the dressing tents, stalls, stables, &c., were lit up with these lamps. Messrs. Oliver, Clark made and fitted on the front of the grand stand 10 illuminated letters 4 ft. × 3 ft. 6 in., for showing the performers the positions they had to take up. They also made and erected on the grounds 10 illuminated episode signs (5 ft. × 3 ft. 6 in.) for warning the performers when they were to be ready for the next episode. Each one of these signs was provided with 28 different numbers, made of zinc, to slide in and out. To illuminate the orchestra 50 8-c.p. incandescent lamps were fitted, and there was also a 50-ampere photographer's lamp in the grounds for Messrs. Russell and Sons, who were taking photographs of performers up to 10 o'clock at night in the open grounds. To carry out the foregoing work over 25 miles of wire and cables of various sizes were used. The supply was obtained from the Fulham Borough Council, who ran three special mains for a distance of some 300 yards. The electrical contractors were, therefore, able to arrange the lighting on three separate circuits in case of a breakdown, but we learned that up to yesterday they had not had a fuse blow, although the company's mains were very heavily overloaded at the commencement, so many extra lights being required. The whole of the lighting was controlled from one switch room, which was connected to different parts of the ground by telephone.

Turkey.—La Société Générale de Tramways, de Transports et d'Electricite, à Smyrne, is the name of a new company which has just been formed in Brussels, with a capital of £68,000.

"Radiant" Ovens.—Mr. C. Fonteyn writes to say that there were some inaccuracies in our article on p. 999 regarding the "Le Radiant" oven; the type shown is not suitable for the English market, which calls for a larger pattern. His letter arrived too late for our "Correspondence" columns, but we hope to insert an illustration of the right pattern (the "Popular" oven) next week.

Holidays.—The annual holiday number of the *Financial News*, which was presented with the ordinary issue of that paper on June 14th, contains small views of, and a good deal of information concerning, British holiday resorts, and some Continental ones.

Catalogues and Lists.—The Consolidated Pneumatic Tool Co., Ltd., 9, Bridge Street, Westminster, W.—New edition of their electric tool catalogue (48 pages) which contains neatly illustrated descriptions of their A.C. and D.C. drills, bench, pedestal and other grinders, coal-boring machines, and many other similar lines. Among the newer types included in the book are a three-speed pillar drill, electrically-driven coal and ore boring machines fitted with split nut and either D.C. or A.C. motors; and a new type of special side spindle corner drill.

Messrs. Merryweather & Sons, Ltd., 63, Long Acre, W.C.—Leaflets relating to chemical fire extinctors and fire buckets, also hose pipes.

The Beaumont and Still Train Lighting Co., Ltd., 20, Charles Street, Hatton Garden, W.C.—A small and neat book of some 30 odd pages containing a description of this (Mackie's patent) system of electric train lighting, with illustrated instructions for installing the apparatus, also a diagram of connections and an explanation thereof. In parallel columns are stated the chief requirements to be complied with in a successful system, and how they are fulfilled in this particular system.

Messrs. Archibald J. Wright, Ltd., Leyton Green Road, N.E.—June illustrated price lists of automobile ignition and other electrical accessories and electrical instruments.

Messrs. Davies Bros. & Co., Crown Works, Wolverhampton.—Catalogue, 20 pp. (No. 67), with illustrations of their iron buildings and sheds, water tanks, and other like manufactures.

Messrs. Alfred Herbert, Ltd., Coventry.—Copy of the seventh edition of Section "C" of their catalogue, giving, in their usual admirable style, illustrations and particulars of their No. 1 Universal cutter grinder, also their No. 4 patent Universal cutter and tool-grinding machine. The latter is a recently introduced machine, in which they have applied the advantages of wet grinding to the sharpening of milling cutters and fine tools, with the result that cutters can be ground quicker, and without danger of drawing their temper. The machine is designed with micrometer adjustments, and clearance tables are provided. In addition to grinding milling cutters up to very large sizes, the machine is intended for general tool-room use, doing any variety of circular and surface grinding. The patented feature, which gives the universal character to the machine, is a combination of quick and slow movements to the two conjugate adjustments of the tables, viz., either the longitudinal or the cross adjustment may be used for traversing the work across the wheel with a quick feed, or for putting on the cut with a fine feed. This enables a great variety of work to be ground without special appliances. The machine is also supplied in a simple form for ordinary cutter and reamer grinding, and

accessories can be purchased separately. The catalogue gives particulars of the various accessories which are supplied.

Indestructible Cable Co., 47-51, Park Street, Southwark, S.E.—12-page booklet, dealing with the advantages claimed for their "Indestructible" insulated wires and cables.

Engineering Instruments, Ltd., Skerne Works, Darlington.—Specimen sheets of the firm's manufactures in motor-control switchgear and "Direkton" motor-starters. As announced last week, the company has removed from Islington to the above address, where works have been fitted up with modern equipment for dealing with these and their other specialities.

The Electrical Co., Ltd., 121-125, Charing Cross Road, W.C.—Trade circular announcing reduction in list prices of Aegma metal lamps.

The British Thomson-Houston Co., Ltd., Rugby.—Price list (No. 214) just issued gives particulars of B.T.-H. tungsten lamps, including a table of approximate candle-powers in which they are made, also prices, dimensions, and conditions of sale. We are asked to say that the lamps are rated according to the British standard, and that they are made in Rugby.

Sterling Telephone and Electric Co., Ltd., 200, Upper Thames Street, E.C.—Catalogue No. 150 gives a great deal of material, profusely illustrated as usual, relating to the Sterling telephones and electric bells, and gives the latest prices (many of them reduced) of all the firm's principal manufactures. Commencing with the well-known "Parlyphones" and "Twencen" telephones, we pass through the 76 pages of the publication, noting on the way, battery and magneto ringing telephones, automatic intercommunication instruments, mining telephones, central station switchboards, central battery and portable military telephones, extension switches, numerous bells, buzzers, electric syren, bell indicators, pushes, switches, fire alarm devices and boards, measuring instruments, batteries, telephone wires and cables, and a number of sundries. The company announce to the trade in the front of this book that they have taken new and extensive works at Dagenham, Essex, and within a reasonable time they hope that all their telephones and bells, &c., will be made throughout in England.

Messrs. Crompton & Co., Ltd., Salisbury House, E.C.—New pamphlet describing the Hounsfield patent excess speed alarm for motor vehicles. This alarm has been designed to meet the suggestions recently made by the police authorities.

The Midland Engineering Co., Ltd., 2, Victoria Square, Birmingham.—New booklet (12 pages) giving some information and a number of half-tone views of their "Zylba" patent condensing and cooling plants, including some in service at Worthing, Colwyn Bay, Wednesbury, Aston Manor, Islington, and Leyton electricity works. A list of users is given at the end of the pamphlet.

The London Electric Wire Co. & Smiths, Ltd., Playhouse Yard, Golden Lane, E.C.—Revised and enlarged 8-page trade catalogue of insulated high conductivity copper and aluminium wires, giving not only the actual thickness of covering for every class of covering and size of wire, but also containing wire tables for both copper and aluminium, thus enabling a comparison of the utility of the respective metals for a given purpose to be readily and quickly made.

The Sun Electrical Co., Ltd., 118-120, Charing Cross Road, W.C.—Price leaflet relating to a new self-adjusting nipple for metallic-filament lamps—the chief points for which are its small size and low price—and some new cigar-lighters.

Messrs. W. Geipel & Co., St. Thomas Street, S.E.—Four-page list effectively showing the Henrion graphitic carbon brushes, and giving particulars and prices of same, together with instructions for their use.

Book Notices.—"Electrical Practice in Collieries." By D. Burns. London: C. Griffin & Co., Ltd. 1909. Price 7s. 6d. net.

"Electrical Installations." By Rankin Kennedy. Vol. IV. London: Caxton Publishing Co. 1909. Price 7s. 6d. net per volume.

Journal of the American Society of Mechanical Engineers. June, 1909. Baltimore, U.S.A.: The Society. Price $1.

Bankruptcy Proceedings.—Gustave & Charles Markt, trading at 148-150, Curtain Road, E.C., as importers of electrical accessories, &c., under the style of Markt Bros. & Co.—The first meeting of creditors was held on June 15th, at the London Bankruptcy Court, before Mr. G. W. Chapman, Official Receiver, under the receiving order made on May 27th, upon the petition of a creditor. Accounts have been filed showing unsecured liabilities £16,155, against assets valued at £417, exclusive of certain book debts, amounting to £8,625, returned as valueless. It appeared from the debtors' preliminary examination, that they started business in 1896 at 38, Beech Street, Barbican, in partnership, with a capital of £2,000 lent by their mother, who subsequently advanced further sums amounting, in all, to £4,300. They traded as importers of, and dealers in, electrical accessories, bicycle accessories, and fancy goods. In 1906 they removed to 148 and 150, Curtain Road, and continued a fairly successful business until last autumn, when they sustained heavy losses by bad debts, and further lost their principal agency. The position was rendered still worse by shortness of capital, owing to their money being locked up in the Autoclaw Co., Ltd., which had been formed in 1905, to take over the electrical part of their business; the debtors were appointed joint managing directors of the company, which is now in liquidation. In consequence of those losses they found it impossible to continue the trading, and in April they instructed Messrs. Child & Co., to investigate their affairs. A private meeting of the creditors was held on April 21st, when a statement of accounts was presented, showing assets between £9,000 and £10,000, and liabilities £15,000. That meeting was adjourned with a view to some scheme of arrangement being made, but in the meantime a petition was filed by a creditor, and the debtors were advised to consent to bankruptcy proceedings being instituted. They attribute their failure to want of capital, to the collapse of the Auto-claw Co., Ltd., in which their money was invested, bad debts, depression of trade, and to the loss of their principal agency. No offer was submitted on behalf of the debtors, and a resolution was passed for Mr. S. P. Child, C.A., to wind up the estate in bankruptcy, assisted by a committee of inspection. The public examination of the debtors is fixed for July 2nd.

Bridgewater & Wright, electrical engineers, 78, York Road, King's Cross.—Under a receiving order made last March, a sitting was held on June 16th, before Mr. Registrar Giffard at the London Bankruptcy Court, for the public examination of the debtors. Mr. W. P. Bowyer, assistant Official Receiver, reported that Mrs. Charlotte Rix was in attendance and willing to be examined, but the statement of affairs had not yet been lodged, and further time was required for investigation purposes. Under those circumstances he asked for the public examination of the debtors to be adjourned. Mr. Cotton said he appeared on behalf of Mrs. Rix, who knew nothing whatever about the business, although she had been made the person responsible to the Court. He asked for assistance in the preparation of the statement of affairs. His Honour adjourned the sitting until July 21st, and directed the debtors to lodge the account on or before June 30th.

W. T. Garnett, electric cable maker, Bradford.—July 16th is the last day for sending proofs for intended dividend to the trustee, Mr. E. Musgrave, 1, Bank Street, Bradford.

J. G. S. Cunnington & H. P. Allison, trading as Laing, Wharton and Cunnington, electrical engineers and contractors.—The senior Official Receiver (Mr. E. Leadham Hough) in his observations on this matter, in connection with which the statement of affairs shows a deficiency of £2,756, says that the bankrupts attribute their insolvency to the judgment obtained against them (see Electrical Review, June 4th, page 923) by the vendor in the matter of the Improved Electric Supplies, Ltd.—they contended that they had received consideration only to the extent of between £4,000 and £5,000—and to law costs and expenses incurred in connection with the action brought against them by him. The following deficiency account is dated May 30th, 1908:—

Bad debts		£411
Loss on purchase of the business and assets of the before-mentioned company, being difference between the value of the assets taken over and amount awarded vendor by the Court		3,675
Law costs and expenses incurred as above stated		762
Depreciation in the value of the following assets as now estimated for realisation, viz.:—Stock-in-trade, £696; fittings, &c., £717		1,413
Partners' drawings:—Cunnington, £550; Allison, £520		1,070
		£7,332
Deduct:—Surplus on May 30th, 1908, £3,717; further capital introduced by the bankrupt Allison to pay law costs, £470; profit in trading, £389		4,576
Deficiency as per statement of affairs		£2,756

The separate estate of J. G. S. Cunnington shows a deficiency of £820, and in the matter of H. P. Allison it is stated that the surplus of £83 11s. appearing on his separate statement of affairs should have been carried to the credit of the joint estate. The public examination was to take place on June 23rd.

Re William Cope, 100, Bournbrook Road, Selly Park, Birmingham, journalist and inventor.—The liabilities in this case were estimated at £1,317 and the assets nil. The cause of failure was ascribed to losses in connection with the development of a patent for shallow conduit electric traction whereby debtor became liable for £1,400. At the public examination in Birmingham on Monday, the debtor said that, in 1891, he came to that town to edit a newspaper, and four years later, he and two others promoted a company known as the Cope-Collis Syndicate, Ltd., to acquire certain patents which debtor had taken out in connection with a conduit for electric tramway traction. As vendor, he should have received £750 in cash and 6,000 £1 shares in the company, but all he had from the promotion was 3,900 £1 shares, which were of no value. In September, 1907, he was appointed managing director of the company at a salary of £350 a year. Nothing, however, had been paid him in respect of such salary, and no work was being done. Debtor was still working on the patent, and hoped to see something made of it. The debtor, who is 67 years of age, said he was previously bankrupt in 1888, and had not obtained his discharge. The examination was closed.

Wind Power.—Messrs. J. G. Childs & Co., Ltd., of Hawthorn Road, Willesden Green, send us a description of their exhibit at the Royal Agricultural Show at Gloucester this week, together with a pamphlet on their wind turbines, specially prepared for this show. They are exhibiting a 24-ft. plant, which consists of their special turbine upon a steel tower 60 ft. high, with vertical shaft driving a Morris-Hawkins variable-speed generator placed vertically, at 50 volts, and charging a 28-cell Pritchetts & Gold battery, having a discharge capacity of 450 ampere-hours. They have brought out an electric oven, in which special attention has been given to heat insulation. It differs from all other ovens in that it has a polished marble top and oak sides, and looks more like a piece of dining-room furniture than the conventional oven. There is no external heat, and it works on less than half the current consumption of other ovens. The plant is supplying the energy for running a variety of cooking apparatus by the Phœnix Electric Heating Co., and a deep-well pump by Messrs. Le Grand & Sutcliffe, a butter churn and cream separator by the Dairy Outfit Co.

and a circular saw of special design suited for turbine driving of their own make. The generator has a special switch by means of which it can be run as a variable-speed motor for driving any of the above machines when there is no wind, taking current from the battery. This plant, in localities where the wind averages about eight miles an hour, will produce about 3,000 units per annum.

Trade Announcements.—The International Electric Co., late of 55, Redcross Street, Barbican, announce that with the view of facilitating the general management, on June 24th they removed their offices and stock to newly built premises adjoining their factory at Kilburn. Their only address henceforth will be Telephone Works, 111-115, Salusbury Road, Kilburn, N.W. Their telegraphic address remains as heretofore, "Genest, London," and the new telephone numbers are:—477 P.O. Willesden, and 488 Paddington.

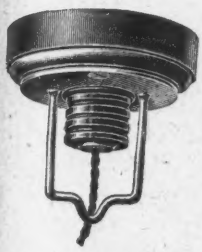
Messrs. H. G. Mayer & Co., 67, Aldersgate Street, E.C., have secured the agency of the "Maerkische Drahtwerke" (wire works) for the finer sizes of copper, bronze and brass wire from No. 17 to 50 S.W.G.

The Forest City Electric Co. have just removed to 4, Collier Street, Greengate, Salford. Leaflets relating to their protected flat-wire cable and solid-wire rail bonds have been received.

The new joint stock companies registered in Scotland last week include Maxwells (Dundee), Ltd., 26, St. Andrew Street, Dundee, with a capital of £25,000. The company is a private one, formed to acquire and carry on the business of Maxwell, Son & Co., electrical, mechanical, and motor engineers and brassfounders.

The British Oil Co. removed on June 24th, from Dashwood House, E.C., to more commodious premises at Norfolk House, Laurence Pountney Hill, E.C.

Wiring Accessories.—Referring to Mr. Toppin's article in our issue of June 11th, the General Electric Co., Ltd., point out that for some time past they have been supplying the "New Era" block for ceiling roses, which exactly fulfils the requirements specified in the article; the ceiling rose is screwed into the



Ceiling Plate and Plug.

"New Era" Block.

wood block, flush with the surface of the latter, as illustrated herewith, enabling fittings to be wired quickly, and removed without cutting wires or damaging decorations. Either two-way or three-way ceiling roses can be supplied. Another device is also shown, for use with a plug and socket, so that the fitting can be put up and removed with facility whenever desired; the weight of the fitting is carried by the brass plate and loop.

Liquidations.—Electric Taxicab Co., Ltd.—This company is winding up voluntarily with Mr. W. Milne, 9, New Broad Street, E.C., as liquidator. A meeting of creditors is called for July 5th.

Generators, Ltd.—Creditors must send particulars of debts, &c., to Mr. G. B. Murgatroyd, Duchy Chambers, Clarence Street, Manchester, the liquidator, by August 5th.

City of York Tramways Co., Ltd.—A meeting is to be held at St. Stephen's House, Victoria Embankment, S.W., on July 23rd, to hear an account of the winding up from the liquidator, Mr. H. G. Simmonds.

Auto-Controllers, Ltd.—First meetings of creditors and contributories are to be held at Arcade Chambers, Bournemouth, on July 1st.

Uxbridge and District Electric Supply Co., Ltd.—A petition for winding up this company was presented on June 17th by Callender's Cable and Construction Co., Ltd. It is to be heard on June 29th.

United Kingdom Tramway, Light Railway and Electrical Syndicate, Ltd.—This company is winding up voluntarily.

Lumb Electrical Bleaching Co., Ltd.—A meeting of creditors was to be held at Thatched House Hotel, New Market Place, Manchester, on June 24th.

General Water Power, Ltd.—A meeting is to be held at 11, Cornhill, E.C., on July 20th, to hear an account of the winding up.

The Electrical Publishing Co., Ltd.—A meeting is to be held at Bazaar Buildings, Drury Lane, W.C., on Wednesday, August 11th, to hear an account of the winding up from the liquidator, Mr. J. H. Moritz.

Japan.—The *Indian and Eastern Engineer* quotes a Japanese paper to the effect that there are at present only a few electrical engineering establishments in Japan, the two most important being the Shibaura Engineering Works and the Tokio Electricity Co., which is a joint enterprise of the American General Electric Co. and a body of Japanese. The former has a capital of 1,000,000 yen and the latter 700,000 yen. With this rather inadequate capital, although doing good business, both companies have been confined to a limited scope. Negotiations are now in progress to amalgamate the two works, and form a new company with a capital of 4,000,000 yen, 51 per cent. of which sum is to be held by the General Electric Co. in exchange for the entire patent rights possessed by the company.

Where to Advertise for Tenders—A Local View.—Discussion arose at the last meeting of the Hornsey Borough Council with regard to inviting tenders for the installation of the electric light at the North Harringay school. On a motion that advertisements be inserted in two local papers inviting quotations, Mr. Jenkinson suggested advertising in the electrical press. To this Mr. Grayson objected upon the ground that there were wiring contractors in the district able to do the work, and it was inadvisable to invite outsiders. Alderman Agnew concurred in this view, and other members pointed out that if advertisements were inserted in the electrical press the information as to the work being about to be undertaken would be widely diffused, with the result that probably they would be compelled to give the job to some person outside the district. The Mayor (Mr. Ebblewhite) expressed the opinion that the Education Committee ought to have communicated with the firms which had displays at the recent Electrical Exhibition, but in reply to this it was urged that other local tradesmen besides the exhibitors should have an opportunity of tendering. In answer to further discussion, Councillor Brackenbury said the hands of the Committee had been tied by a resolution to the effect that work over £50 must be advertised. Mr. Jenkinson moved and Mr. Pigden seconded, that in the interests of the undertaking an advertisement should be inserted in one of the trade papers as well as in the two local papers. This proposal was negatived, and the Committee's recommendation that advertisements be inserted only in two local papers was carried. We are sorry that we cannot aid the Borough Council in its efforts to prevent a wide diffusion of this piece of information regarding work open to tender.

Plant for Sale.—The Sheffield Corporation Tramways Committee is offering certain steam and electric generating plant, &c., at Kelham Island power station, for sale. Some particulars appear in an "Official Notice" this week.

"Metalik" Lamps.—Messrs. G. M. Boddy & Co., of 15, Gray's Inn Road, W.C., and Newington Works, Liverpool, state that several improvements have recently been introduced into their metal-filament lamps, which are now made of low candle-power, and have been further reduced in price.

LIGHTING and POWER NOTES.

Aberdeen.—The Corporation decided last year to carry high-tension and low-tension cables into Woodside, Bucksburn and Stoneywood, with a view to supplying current to customers in those districts. The encouragement received in respect of the number of actual and prospective customers is stated to be such as to fully justify the decision. A supply of electricity is now available in the Bucksburn and Woodside districts, the supply being alternating current—single-phase, 250 volts for lighting, and three-phase, 400 volts for power purposes. From the transforming sub-station at Bucksburn the high-tension cable has been extended to Stoneywood for the wireless telegraph station which is being erected there by the Admiralty; and from the same point low-tension supply cables have been laid northward as far as the terminus of the suburban tramway line at Bankhead, and southward to the fountain at Woodside. As to the demand for current for lighting purposes, the indications are that it will be good throughout the districts. All the cable-laying work has been carried out by the Corporation electricity department, under the supervision of Mr. J. A. Bell, the Corporation electrical engineer.

Acton.—The Council has passed the following resolution:—"That subject to the clerk receiving a letter from the Metropolitan Supply Co., that it will regard its offer of November 3rd last, and the Council's acceptance of it, as a binding agreement, the electrical engineer immediately prepare the electric arc street lamps in the specified roads and have the same ready for use and again light such roads with electric light on and from July 1st next." A number of tradesmen have objected to the proposal to raise the price of energy by 50 per cent. to 6d. per unit. They ask that, as the light from shop windows helps to illuminate the streets, energy be supplied to shops at the former rate of 4d. per unit. They further say that unless they obtain this concession they will consider the advisability of using gas.

Aldershot.—The U.D.C. has decided to apply to the L.G.B. for a loan of £1,000 for mains extensions.

Auchlochan.—Electric power applied to farm uses is shown at the mixed farm of Auchlochan, in the West of Scotland. A turbine is set in the valley by the small river Nethan, and this gives power for the farm offices and the lighting of the steading and the farmhouse. Power for grain hoisting, hay chaffing, oats threshing, &c., is furnished from this source.

Beckenham.—The subject of the period of the wiring agreement in cases where houses or other premises are free-wired, came before the Council again on Monday night, and it was decided

that in all future cases of wiring agreements with the owners of property, the period of the agreement be five years, subject to determination on sale. The period originally was 10 years. The Chairman of the Electricity Committee has brought forward proposals that the Council should free wire and provide current in certain cases for a fixed sum per lamp per annum, and that it should provide a less expensive form of wiring. The matter has been adjourned for a fortnight pending the reply by the B. of T. to questions by the clerk to the Council on a legal point arising out of the proposals.

Belfast.—Additional lighting is to be carried out at Messrs. Hughes' bakery, which will involve a considerable extension of the mains.

Bexhill.—Mr. R. H. Bicknell, M.I.C.E., held an inquiry on Tuesday respecting the application of the Council to borrow £220 for mechanical stoker, and £1,900 for condenser and cooling tower. The town clerk reminded the Inspector that on his last visit in April, 1905, which was followed by special investigation by L.G.B. into the position of the undertaking, there was debit balance on revenue account of £2,092. That had been wiped out, and at the end of March, 1909, there was credit balance of £726, and £466 had been set aside for depreciation. The Inspector expressed a hope that the depreciation fund would be increased. The Board did not regard repayment of loans as depreciation at all. The Council were now taking the right line in putting aside out of profits as much as they could to replace worn-out machinery and buildings. The Town Clerk: We are doing more for depreciation than the majority of Corporations throughout the country. The Inspector: You may lay that flattering unction to your soul. I think that is true, but it is nevertheless a fact that very strong pressure is being put on other Corporations.

Brighton.—The B. of G. has accepted the terms of the T.C. for the supply of energy for driving the machinery at the Workhouse by electricity in lieu of steam. Electricity will effect a saving of £85 a year, and the T.C. will grant a special sliding tariff for current for lighting, which will effect a saving of 13 per cent. per annum.

Broughty Ferry.—The Electricity Committee is considering a recommendation to install fuse-boxes throughout the whole of the feeders and distributors in the town; the estimated cost for 60 boxes is £700.

Colchester.—The gross profit of the Corporation electricity undertaking for the past year was £6,148, and after providing for fixed charges, a net profit of £247 remained, which was transferred to the depreciation account. The working of the Corporation tramways for the year showed a deficit of £3,300. The corresponding deficit for 1907-8 was £2,289, so that the past year's working was £1,011 worse than that of the preceding 12 months.

Continental Notes.—AUSTRIA.—A case which recalls the amenities between the electric lighting companies at Vienna and the municipal council a few years ago is now in progress at Buda-Pesth, although the former ultimately ended with the purchase by the town council of the undertakings of the supply works by agreement. At Vienna municipal jealousy and rivalry played a part in the programme, but this stage has not yet been reached in the Hungarian capital, where the inconsiderate action of the Buda-Pesth and Hungarian Electricity Companies towards consumers, it is said, is to be rendered impossible by the establishment of municipal works at an estimated expenditure of £416,000. Apparently the charges made by the two companies are excessive, in the opinion of the town council, although this is rather a strange fact to be discovered at the late date of two years from the period when the undertakings become purchasable by the city. At any rate, it is reported from Buda-Pesth that the expropriation of the companies appears out of the question, as the agreement between them and the city provides for the payment by the latter of 75 per cent. in excess of the estimated value. The municipal scheme, which is also associated with a proposal to acquire the local electric tramways, consequently promises to resemble the precedent of Vienna, where the squeezing process adopted by the municipal council eventually accomplished the object in view.

GERMANY.—A company has recently been formed at Heegermuhle, with a capital of £100,000 and the title Die Markische Elektricitäts Gesellschaft, to establish a large central electricity generating station at Heegermuhle (Brandenburg) for the supply of energy for lighting and power purposes in the Barnim and Tamplin districts of Germany. The Allgemeine Elektricitäts Gesellschaft, of Berlin, is interested in the new undertaking.

Coventry.—The annual accounts of the electricity undertaking show a net profit of £3,765 for the year. It is proposed to pay £1,000 to the general district fund in relief of the rates, £2,598 to the reserve fund, to transfer that fund to capital account in order to meet certain capital expenses so as to obviate the necessity of raising loans, and to carry forward to next year's revenue the balance of £1,670.

Darwen.—The T.C. has, on the recommendation of the Weaving Class Committee, decided to purchase a 15-H.P. electric motor for the municipal weaving shed, and to dispose of the present motor.

Dublin.—Mr. P. C. Cowen, L.G.B. Inspector, opened an inquiry on 21st inst. into an application of the Corporation for sanction for a loan of £100,705 to complete the electric lighting system of the city.

Ecuador.—The *Registro* of March 19th publishes an agreement, under the terms of which Senor Emilio Estrada is granted a concession to utilise the waters of the River Chimbo, at a point situated about six miles from Bucay, with the object of generating electric power, which will be conveyed through conductors to the town of Guayaquil for industrial and traction purposes.

Exeter.—The report of the electrical engineer, Mr. H. D. Munro, on the working of the electricity undertaking for the year ending March 31st, shows that the total units were 1,370,288—an increase of 62,600 over the previous year. The increases were: for tramways, 6 per cent.; for general lighting, 4 per cent.; for power, 12 per cent.; and for public lighting, 2 per cent. The output for new consumers is at present being balanced by the savings made by existing consumers through the use of metallic-filament lamps. The increased supply has been given without any increase in the total expenses. An extra charge of £250 for income-tax, &c., has been balanced by a reduction in the coal bill, £50 of which is due to lower prices and the rest to improved economies at the power station. About £200 for meters in excess of loans sanctioned and for minor additions at the power station and the sub-stations, have been paid out of current revenue, and this expenditure also has been balanced by economies in other directions. The reduced rates of charge, which have been in force for three-quarters of the year, have decreased the revenue by over £1,000, but the actual receipts are only some £400 less than in the preceding year, and the net result is a surplus of over £2,000. The Committee has recorded its appreciation of the excellent services of the electrical engineer and his staff.

Falkirk.—The Corporation electricity department is reducing its charges for current for power purposes.

Fife.—Much progress has been made at Rosyth Naval Base; the contractors are considering the advisability of utilising electric cranes in view of their greater expedition.

Heston and Isleworth.—A Sub-Committee has reported to the U.D.C. that it has examined the Twickenham and Barnes electricity works, with a view to finding a cure for the smoke nuisance at their own works, and it recommends the use of a Babcock & Wilcox mechanical chain-grate stoker, which could be fixed for £310, and also the use of bituminous slack coal. It was found at Barnes that the use of this form of coal effected a saving of 20 per cent. The Council has adopted the recommendation, and accepted the tender of Phillips & Co. for the specified coal at 12s. 5d. per ton delivered at the works. As the tenders for laying a new feeder cable to Hounslow were considerably in excess of the estimate, the engineer has been instructed to obtain his own labour and carry out the work.

Hoylake and West Kirby.—It is intended to hold an electrical exhibition at Hoylake and West Kirby in the autumn. Extensions are being made to the system in all directions. In the report for the year ended March 31st, 1909, it is stated that the revenue was £8,083, with a net profit of £567.

India.—The *Indian Textile Journal* reports that an electric lighting scheme, prepared by the electrical advisor to the Government of India, has been accepted by the authorities for the lighting of Shillong. Power will be obtained from waterfall in the neighbourhood of Shillong, and the scheme provides for effective street lighting, and also for the supply of energy to Government offices and private residences. The total cost of the installation has been estimated at Rs. 1,75,000.

According to the *Indian and Eastern Engineer*, the Municipal Committee of Simla purpose shortly considering the matter of applying to the Punjab Government for a licence under the Indian Electricity Act, with a view, eventually, to taking over and working the system of electric supply when the hydro-electric installation at Basantpur, in the Nauti Khud, has been completed. "There is ample time for the consideration of the question, as the preliminary work in connection with the installation has only recently been begun, and it will take at least two years to complete it."

Llandudno.—At last week's meeting of the U.D.C. reports were presented by the gas engineer (Mr. Stephenson) and the electrical engineer (Mr. Morton) with reference to a test of lighting systems which are in operation on the Promenade. A number of self-intensifying gas lamps and a number of flame arc electric lamps have been in use for several weeks, with a view to the respective merits of the two systems being tested side by side. The gas lamps cost 0·93d. per hour, and the electric lamps 0·90d. per hour.

The U.D.C. has received from the L.G.B. sanction to a loan of £2,450 for additional plant at the electricity works.

Littleborough.—The Rochdale T.C. has decided to supply electricity in bulk to the U.D.C. at 10 per cent. over the cost price of generation. None of the electricity is to be supplied by the U.D.C. at less than the price in Rochdale, either for lighting or power.

Lochgelly.—The electrical plant and equipment now completed at Lochgelly, in Fife, is stated by a correspondent to be the most modern applied to any colliery in Fifeshire. There are 10 pits, covering an area of about 16 square miles. Until the end of last year numerous isolated continuous-current plants of low and medium pressure supplied both power and light. The more modern consisted of Bellis & Morcom high-speed vertical engines

direct coupled to generators, and the remainder of low-speed horizontal engines connected to generators by belt drives. After consultation with experts the directors of these collieries decided to do away with the method of scattered plants, and to generate in bulk at high pressure at a convenient centre and distribute to the several consuming points. The advantages gained by the adoption of this method are:—Better load factor, greater efficiency, greater flexibility, and the ability to transmit power easily to any part of the field as occasion demanded; economy in raising the whole of the steam required at a washery where dross and gum are available; economy in labour, reducing the number of chargemen and attendants; economy in the more efficient supervision; extensions simplified and less costly. Now that the central system is adopted it is calculated that with regard to the outlay it might be taken that the generating costs, plus the capital charges—namely, interest on capital, and sinking fund to redeem the capital in 20 years—would enable the company to deliver electrical energy at any point in the coalfield for something less than 0·3d. per Board of Trade unit. With an increased load the cost per unit would be even cheaper, owing to the fact that much of the capital expenditure already incurred really belonged to these possible and probable extensions in connection with the Lochgelly collieries.

London.—ISLINGTON.—The electricity account for the year ending March 31st last shows a surplus of £4,263. The receipts amounted to £52,244, of which £15,734 was for public lighting. On the other side the cost of generation was £16,693, and of distribution £2,034. General expenses absorbed £6,084, while rents, rates and taxes accounted for £1,830. Altogether there was £25,752 excess of income over working expenditure. The reserve fund on March 31st amounted to £18,758, while the loans outstanding on the same date were put at £415,554.

HACKNEY.—Mains are to be laid at a cost of £1,156.

MARYLEBONE.—At the meeting of the B.C. on June 17th, it was stated that Mr. Seabrook had taken up his duties, and the Electric Supply Committee had approved a scheme submitted by him for the future management of the undertaking. The statement of accounts for the year ended March 31st last, which will shortly be issued, will show, the Committee states, a better return than was anticipated. While the Committee does not recommend any alteration in the existing tariff at present, it may during the ensuing year consider further optional but practically equivalent tariffs.

STOKE NEWINGTON.—A distributor cable is to be laid in Queen Elizabeth's Walk at a cost of £170.

BATTERSEA.—The Finance Committee has recommended that the secretary to the joint electric supply conference be informed that at present the Council "cannot see that any good purpose would be served so far as they are concerned" by joining in the conference.

Maghera (Ireland).—The subscribers to the proposed public electric lighting scheme have approved an agreement with Mr. John Millar for the erection of poles, brackets, street lamps, cables, &c., in connection with the supply to the premises of the subscribers.

Manchester.—In its report for the year ending March 31st, the Electricity Committee points out that the receipts for sales of energy amounted to £361,116, and other items of income representing £6,124 brought the total to £367,240, as against £384,602 for the preceding year. The working expenditure (including the provision in the year 1908 of £40,000, and in the year 1909 of £21,495 for future renewals) was £205,534, as compared with £219,358, so that the balance of profit for the past year was £161,706, and £165,244 for the year which ended in March, 1908. There was a net surplus of £12,000 (against £19,543 last year), which was handed over to the city fund in aid of the rates. The reserve fund at the beginning of the financial year stood at £13,854, and the balance to next year is £6,358. Owing to the depression in trade, the number of distributing stations put down on consumers' premises for the purposes of power supplies, fell considerably below the number in the preceding year. Over 14 miles of new street mains have been laid during the year. The total output of electricity from the three generating stations during the past 12 months amounted to 88,766,232 units, as compared with 82,752,989 units in the previous year, an increase of 7·27 per cent. The quantity measured and accounted for during the same time was 73,715,884 units, showing a difference of 15,050,348 units, or 16·96 per cent., being the quantity used in distribution or otherwise not accounted for.

Market Harborough.—The B. of T. has granted the U.D.C. a further extension of a year for carrying out the E.L. order.

Merthyr Tydfil.—The T.C. has accepted the tender for the Electric Traction Co. for the public lighting of the district between the lower end of the borough and the southern end, at £240 per annum. The Gas Co. tendered at £244 4s.

Newton-in-Makerfield.—The B. of T. has refused the application of the U.D.C. for an extension of a year for carrying out the E.L. order; the latter is to be revoked forthwith.

Petersfield.—The U.D.C. has abandoned the idea of applying for a prov. order for electric lighting this year.

Plymouth.—By 19 votes to 12 the B.C. has resolved to substitute electricity for gas at the Regent Street School, at a cost of £170.

The assessment of the electricity undertaking has been increased from £3,000 to £4,500.

Shrewsbury.—The T.C. is applying to the L.G.B. for sanction to borrow £10,000 for the development of the electric light undertaking.

Southampton.—A L.G.B. inquiry was held on Wednesday into the application of the T.C. for a loan of £3,000 for E.L. purposes.

The T.C. has arranged to supply energy to the London and South-Western Railway Co. for the docks at 1¼d. per unit, on a minimum consumption of 400,000 and not more than 500,000 units per annum, on condition that the supply is a day load and is partially discontinued during the months of December and January.

Southgate.—The D.C. has considered the representations of the local Ratepayers' Association as to the supply of electricity in bulk, and has resolved that the circumstances affecting the supply and distribution in Southgate justify the decision of the Council to transfer its provisional order to the North Metropolitan Electric Power Co. The Association communicated with the Board of Trade, and this authority felt that under all the circumstances the parties to the agreement and the objectors should meet at the Board's offices in order that the matter might be fully dealt with. That meeting has just taken place, but the result has not yet been divulged.

U.S.A.—A telegram from Denver, Colorado, states that a tremendous explosion occurred on the 9th inst. at the city electric power station. Great damage was done to the plant. Three persons were killed, and the entire city was plunged in darkness for many hours.

West Ham.—An agreement has been come to in regard to a supply for power to the Traders' Lumber Co., of Chargeable Lane, Plaistow. They are to take a minimum of 12,000 units per annum.

Weymouth.—At the close of the financial year the Electricity Department had 369 consumers, an increase of 48 on last year, the lamps connected being 27,358 (33-watt), an increase of 3,465. The units increased by 34,636. The gross receipts were £6,210, and the expenditure £2,839, financial charges were £3,270, and the net surplus was £102, against a deficiency of £98 last year, and one of £895 in the preceding year.

Wood Green.—About five years ago the Wood Green Urban District Council, which is now aspiring to become a municipal borough, considered a comprehensive scheme for generating and distributing electricity, and for this purpose it was decided to borrow a sum of between £40,000 and £50,000. The necessary application was duly made to the Local Government Board, who refused to sanction the loan. For some time now the Council has reconsidered the whole situation with a view to deciding what it should do with its provisional order. The only alternatives were:—(1) Should it be used for distributing a bulk supply? (2) Should it be handed over to the North Metropolitan Co.? (3) Should it be allowed to lapse? Special meetings of the Council have been held *in camera*, and it has now definitely decided not to erect a generating station, but to take a supply of energy in bulk from the company on approved terms subject to a satisfactory agreement being arrived at. The Council is advised by its consulting engineers (Messrs. May & Hawes) that the modified scheme will require a minimum of 450 private consumers only to ensure a profit after payment of working and maintenance expenses and capital charges.

TRAMWAY and RAILWAY NOTES.

Australia.—VICTORIA.—The *Australian Mining and Engineering Review* states that the Parliamentary Standing Committee, Victoria, to which all proposals for new lines are first submitted, have recently been considering the question of operating short branch lines electrically. "At present the Committee frequently reports adversely on new lines, because the return would not justify the heavy initial expenditure on track formation, &c., for the heavy steam rolling stock. Certainly it would be possible to lay down a single-track narrow-gauge line, sufficient to cope with a light passenger and goods traffic, and operate same more economically than under present conditions."

Blackburn and Padiham.—Rishton Council has approved of the memorial to the B. of T. for a revival and extension of the Blackburn, Whalley and Padiham Light Railways Order. Great Harwood has followed a similar course, adding that unless work is commenced during the period granted by the order, further extensions of time should not be granted.

British Columbia.—The construction of 100 miles of electric railway—tapping the principal fruit growing centres on both sides of Okanagan Lake, B.C.—is to be started shortly. It is anticipated that the line will be completed within 18 months. The proposed electric system would connect up with the Canadian Pacific Railway and Great Northern Railway, at the northern and southern extremities of Lake Okanagan.

(*Continued on page* 1052.)

ELECTRIC POWER AT MESSRS. CASSELL & CO.'S PRINTING WORKS.

It is many years since the owners of the historic works at La Belle Sauvage first adopted electricity for driving a portion of their machinery, but it is only quite recently that the whole of the works have been electrified and the steam engines and gas engines finally shut down. As in several other old printing works in the City, a beam engine formed part of the steam plant, and this had been used for driving a portion of the works for upwards of 50 years.

One of the first machines to be electrically driven was a large Hoe rotary press, for which a "Bullock" set was installed some 12 years ago by Messrs. Bergtheil & Young. The armature of this machine is of special construction, so arranged that sections can be put in series or parallel for the purpose of speed variation. A special form of drum con-controller is used in conjunction with the motor, which can be stopped by means of push-buttons fixed in several positions on the machine.

The next portion of the works to be equipped was what is called the magazine department, in which such well-known periodicals as the *Quiver* and *Cassell's Magazine* have for years been produced. This room contains a Cotterell rotary press, a battery of guillotines, automatic folding machines, gathering and gluing machines, hydraulic presses, &c., necessary for the complete production of magazine work. The method originally adopted for this department was that of group driving, the advantages of the individual drive not then being fully appreciated. In course of time the motors became somewhat overloaded, and the economical results of electric driving left much to be desired, necessitating some rearrangement of the system. A gas engine was meanwhile installed to relieve the motors of some of the work.

After considering several proposed schemes of rearrangement, Messrs. Cassell & Co. decided to engage an expert to advise them as to the best method to adopt, and Mr. Frank Broadbent, who has specialised in the electrical equipment of printing works, was called in to report on the matter. He advised the shutting down altogether of the gas engine which drove a portion of the department, turning out the then existing motors, and substituting a system of individual driving. This scheme involved the use of about 25 motors in place of the half-dozen or so and the gas engine which were then in use. Some of the smaller machines, such as the folders and stitching machines, were still driven in small groups, but the printing machines themselves were fitted each with its own motor and controlling gear, all speed control being obtained by means of shunt regulation. Wherever possible, the motors were placed on the floor at the end of the machine, the starting gear being fixed on the side frame near the operator's hand. In some cases, where convenient positions could not be found either on the floor or on the machines for the motor and switchgear, the motors were inverted and fixed on the ceiling, driving down to the machine by belt, the starting gear being fixed on hanging brackets from the joists. This arrangement is shown in fig. 1. The starting gear, owing to exaggerated perspective, looks rather high in the photograph, but it is really at a convenient height for the layer-on, viz., about shoulder height.

The effect of this alteration from group to individual driving was a saving representing about 25 per cent. of the previous consumption, in addition to the elimination of all costs of upkeep of the gas engine, belting, and shafting, and the labour attaching to these items.

The other portions of the works were not immediately electrified, but from time to time as new machines were brought in electric motors were fitted to them, and fig. 2 shows one of these, a Victoria platen, driven by a small motor fixed under the table, driving by belt running over a small jockey pulley on to the fly-wheel of the machine. A combined starting and regulating switch is also fixed under the table just above the motor. These machines turn out the beautiful three-colour work for which Messrs. Cassell and Co.'s publications are so noted—such as, for example, the charming plates in the *Feathered World* and the "Natural History of Birds," and those exquisite works of art, "The Nation's Pictures."

As in other printing works where electricity is once put down on really up-to-date lines, the advantages proved so great that the directors finally decided to electrify the whole of the works and shut down the steam plant altogether, and the question arose whether or not current should be generated on site, say, by means of a suction gas plant, or purchased from the public supply company.

In view of the possibility of substantial reductions being made in the near future in the cost of electricity from public supply, owing to the rapidly-increasing proportion of the power load, Mr. Broadbent advised that power should be taken from a public supply in the first instance, if suitable terms could be made with the supply authorities. Eventually satisfactory terms were come to with the City of London Electric Supply Co., who agreed to bring into the building two quite independent sets of supply mains at two different points of the building; that is to say, there is a duplicate supply at two separate points (four services in all) so that in the event of a breakdown of one service the works can be changed over to the other by means of a change-over switch. Usually both services are in use, one for each half of the works.

The mains at each point after passing the Supply Co.'s meters are led into the common terminals of a change-over switch, thence through main switch-fuses to cast-iron distributing boxes, containing switch-fuses for each pair of mains leading therefrom. As the supply is at 400 volts, the distributing boxes are so arranged that it is not possible to open both doors at once; that is to say, only one pole of the circuit can be exposed at a time. The switch fuses are of such a type that it is impossible for an attendant to touch a live terminal in the ordinary handling of the fuses, so that no shock can possibly be obtained, except wilfully.

Each department is provided with its own distributing box, and alongside each box a mercury meter is fixed, so that the consumption in each department is continually recorded. Fixed above each distributing box is a dead-beat moving-coil ammeter with multiple-contact switch, permitting of the ammeter being connected in series with any of the fuses leading to the motors. In this way the engineers can check the current taken by any motor at any time without stopping the machines or interfering with them in any way.

Careful records are kept, and any unusual variation is noted and the cause inquired into. The engineers have found this arrangement to be very useful, as they know at once when any machine is taking too much power either due to belt slip, too much pressure on the bearings, or some want of adjustment, and there is no doubt that the low cost of upkeep and freedom from serious breakdown is largely due to this arrangement, for the old adage, "A stitch in time saves nine," is just as true in the engineering world as in any other department of life.

Fig. 3 shows two departmental distributing boxes with their feeder switches and meters. One example, among many which might be cited, will serve to illustrate one of the advantages of being able to see, by means of an ammeter, just what a machine is doing. A Martini folder had always given considerable trouble, and was continually breaking its belt and getting out of adjustment when driven from the shafting. It was naturally assumed that the belt was too narrow, but it was not possible to use a wider one. As soon as an electric motor was fitted to the machine, the ammeter showed at once that the machine was out of balance and insufficiently fly-wheeled, the power fluctuating between very wide limits. This was remedied, and there is now not a better running machine in the place.

In an old-established works of this nature, there are many problems to be considered which do not crop up in a new works, where the conditions can to some extent be made to suit the electric scheme. In an existing works the electrical details have frequently to be designed to fit in with the

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existing arrangements, and the idiosyncrasies of the machine-minders, as well as the machines themselves, have to be to some extent studied. The positions of the machines, the space available for motors and electrical equipments, and the necessity of preserving the continuity of work, together with

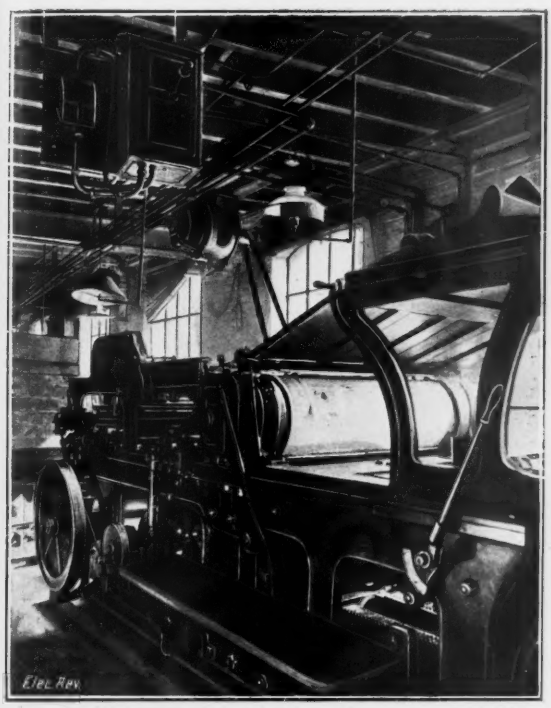


Fig. 1.—"Summit" Machine Driven by Belt from Inverted Motor on Ceiling.

maintaining the recognised methods of working are all points which, to some extent, handicap the designer of the electrical scheme.

Fig. 4 serves to illustrate one of the many problems which have to be met. This illustration shows a double-

Fig. 2.—Victoria Platen Driven by Belted Motor with Jockey Pulley.

feeder machine in which it is essential for the press to be started and stopped by either of the two operators working at opposite sides of the machine. Another requirement is that when the machine is stopped, the brake shall be applied to it. The original mechanical method of working was by means of the brake lever marked A in the illustration. This lever is provided with a handle on both sides of the machine, and served not only to throw the belt from the fast to the loose pulley, and *vice versâ*, but to apply the brake to the fast pulley when the belt was thrown over on to the loose pulley. In order that the operators should not need to change their ordinary method of working, which is a matter of some importance under certain con-

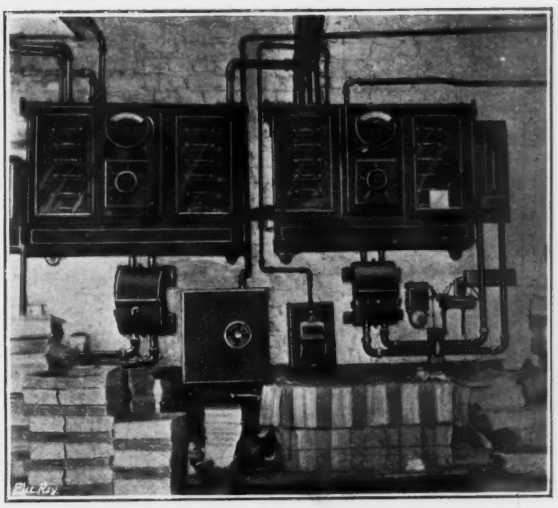


Fig. 3.—Two Distribution Boards, Feeder d.p. Switches, Motor Starter and d.p. Switch.

ditions, the brake lever was retained to operate the electrical control gear. The belt striker forks were removed and the motor geared direct to the driving shaft. A specially shaped cam, lettered B in the illustration, was

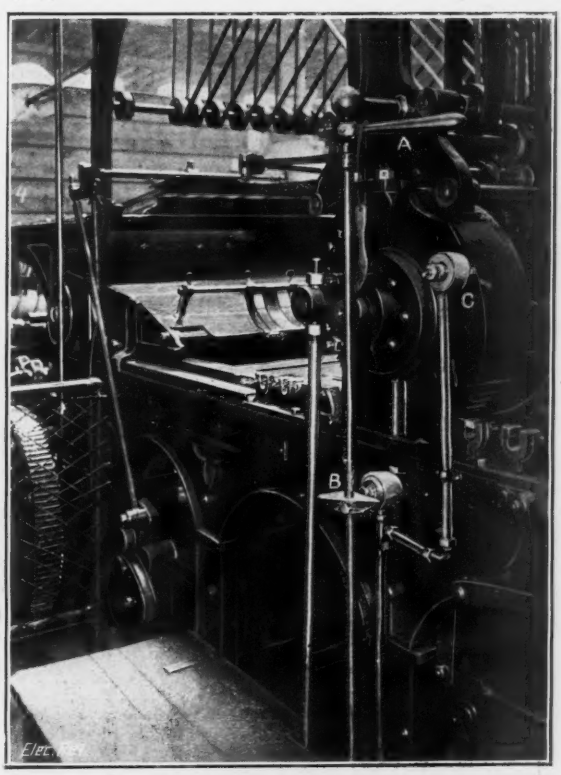


Fig. 4.—Double-Feeder Newspaper Machine Controlled by the Brake Lever.

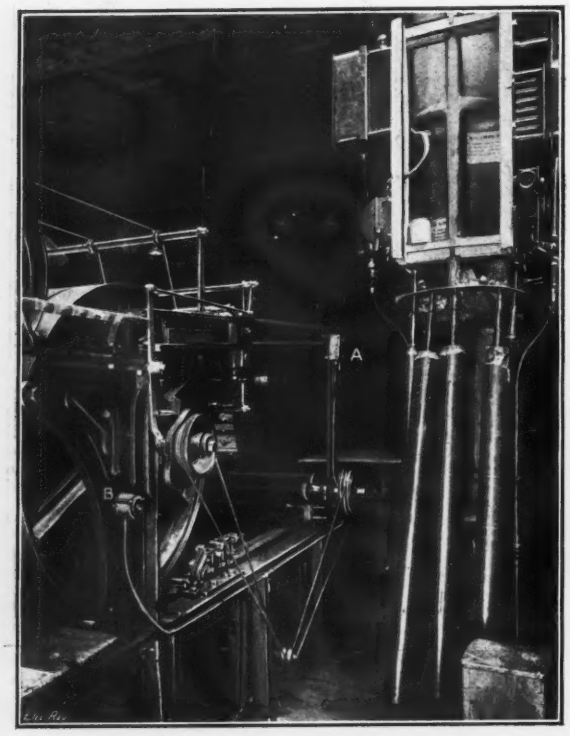
fixed on the brake rod and so arranged as to operate a press button when the starting handle was moved to and fro. To start the machine the brake lever is pulled over in the ordinary way, causing the cam to depress the push, which closes the circuit of an automatic solenoid starter, the brake

being lifted mechanically as before. To stop the machine the starting lever is pushed in the other direction, opening the solenoid circuit and applying the brake. By this means the machine can be "inched" at will, that is to say, the

trically equipped in the main machine room, and the solenoid automatic control was found to be so convenient that it was eventually adopted throughout when the remainder of the works was equipped.

Fig. 5.—General View of Machine Room, showing the Automatic Starting Switches and Speed Controllers on the Pillars.

forme can be moved an inch or less at a time, exactly in the same way as was previously done by striking the belt on and off the pulleys. The switch C is an emergency switch for



A, Pilot or "inching" switch for layer-on; B, Emergency stopping switch for taker-off.

Fig. 6.—Working Side of a "Perfecter."

stopping the machine; when this is in the "off" position the machines cannot be started. This machine, which is used for newspaper work, was one of the first three to be elec-

A general view of the main machine room is given in fig. 5, the solenoid automatic switches and speed regulators being clearly shown attached to both sides of the stanchions supporting the gallery (one of the switch panels is indicated by a +). Below each of the solenoid equipments is a shunt regulator with detachable handle, permitting of the speed of any machine being set by the overseers. It will be observed from this that the whole of the starting and controlling gear are placed in positions which permit of their being easily got at for cleaning purposes, instead of being tucked away in more or less inaccessible positions in the machine frames.

One of the disadvantages of the ordinary solenoid starting

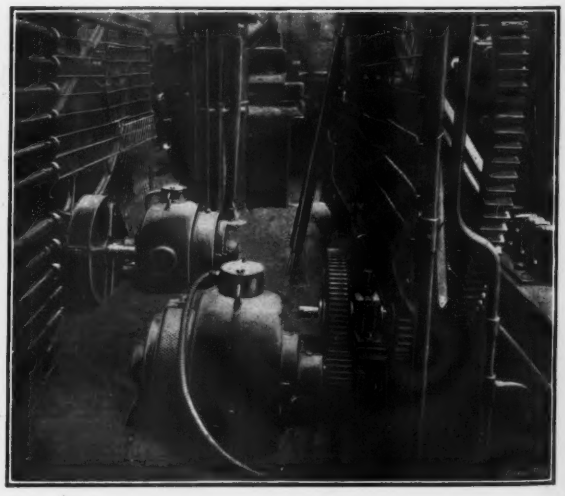


Fig. 7.—Driving Side of Two "Perfecters."

equipment, as usually fitted, is that it is self-starting. In the event of a failure of supply, caused by the blowing of a fuse or any other interruption of the circuit, the automatic

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"ELECTRICAL REVIEW"

	Place.	Supply Authority.	Year of opening.	Engineer.	Pressure of supply, volts.	Frequency and phase.	Total capacity of plant in KW.	Max. load recorded in KW.	Storage battery, max. discharge.	Total capital expended.	Private lighting.	Public lighting.	No. and of pr mo
1	ABERDEEN	Aberdeen Corporation	1894	J. Alex. Bell	220,230 & 440 D.C., tr. 500*	Direct & 50~ 1-ph. & 3-ph.	4,610	3,147	420 KW.	£322,344	4,888 KW.	310 arc, 71 cbn.	652=
2	ABERYSTWYTH	Chiswick Electricity Supply Corporation, Ltd.	1895	E. P. Perkins	220 & 440	Direct	420	220	74 KW.	..	480.5 KW.	29 arc, 8 mtl.	25 H.
3	ACCRINGTON	Accrington Corporation	1900	Harold Gray	230 & 460 tr. 550	Direct	1,588	1,228	160 KW.	£71,641	980 KW.	18 arc, 60 mtl.	241=
4	ACTON	Acton Urban District Council*	1905	J. Martin Blair	230 & 460	Direct	920* (mtr.-gen.)	332	1,000 A.H.	£66,647	919 KW.	64 arc, 128 cbn.	67=2
5	ALDERLEY EDGE AND WILMSLOW	Alderley & Wilmslow Electric Supply Ltd.	1899	Cuthbert W. Bentley	210 & 420	Direct	242	129.3	33.6 KW.	£46,315	470 KW.	1 cbn., 248 N.	14=4
6	ALDERSHOT TOWN	Aldershot Urban District Council	1902	F. Garside	210 & 420	Direct	440	199	150 A.	£27,975	428 KW.	19 arc, 44 mtl., 20 N.	31=7
7	ALLOA	Alloa Corporation	1902	J. W. Napier	220 & 440	Direct	..	98·5	270 A.	£9,500	265 KW.	20 arc	16=2
8	ALNWICK	Northern Counties Electricity Supply Co., Ltd.	1902	J. W. Summerside (Res.)*	230 & 460	Direct	150	130	..	..	285 KW.	..	95
9	ALTRINCHAM & DIST.	Altrincham Electric Supply Ltd.	1895	Geo. H. Fawcus	100	80~, 1-ph.	720	447	..	£66,110	2,020 KW.	..	20=7
10	ASCOT, SUNNINGHILL & SUNNINGDALE	Ascot District Gas and Electricity Committee	1907	A. E. Brooks	220 & 440	Direct	100	20	57 KW.	..	104 KW.	..	
11	ASHTON-U-LYNE	Ashton Corporation	1899	N. Appelbee	240 & 480 tr. 500	Direct	1,760	1,273	..	£64,662	836 KW.	98 arc, 130 inc., 1 N., 20 mtl.	77=2
12	ASTON MANOR AND ERDINGTON	Aston Manor Corporation	1903	R. Foster	230 & 460 tr. 550*	Direct and 50~, 3-ph.	4,665	1,536 lg., 347 tr.	..	£150,000	1,095 KW.	19 arc, 34 cbn., 6 mtl.	3690.5
13	ATHERTON	Atherton Urban Dist. Council*	1903	Chas. T. Astbury	240 A.C., 500 D.C.	50~, 2-ph. & direct	300*	80	..	£10,000	101 KW.	12 arc	20=1
14	AYR	Ayr Corporation	1896	Roland Marshall	100 & 200 A.C. 250 & 500 D.C.	60~, 1-ph., & direct	1,325	794	100 KW.	£99,221	1,678 KW.	111 arc, 184 cbn., 20 mtl., 6 N.	79=2
15	BANBURY	Banbury & District Electric Supply Co., Ltd.	1903	Arthur J. Wray	230 & 460	Direct	662	220	100 KW.	..	293 KW.	..	32=2
16	BANGOR (WALES)	Bangor Corporation	1900	P. F. White	200 & 400	Direct	440	210	84 KW.	£29,732	420 KW.	..	22=1
17	BARKING	Barking Urban District Council	1899	H. L. Howard	230 & 460	Direct	1,010	478	..	£60,000	461 KW.	19 arc, 494 inc., 54 Nernst	64=4
18	BARNES, MORTLAKE & EAST SHEEN	Barnes Urban District Council	1901	C. S. Davidson	210 & 420	Direct	970	470	300 KW.	£63,615	1,425 KW.	88 mtl., 377 N.	60=5
19	BARNSLEY	Barnsley Corporation	1900	E. A. Barker	230 & 460, tr. 500	Direct	1,325	845	150 KW.	£75,371	1,679 KW.	109 arc	125
20	BARNSTAPLE	Barnstaple Corporation	1903	J. W. Hadfield	230 & 460	Direct	375	195	41.4 KW.	£31,600	525 KW.	30 arc, 78 cbn. 93 mtl.	26=7
21	BARROW-IN-FURNESS	Barrow-in-Furness Corporation	1899	H. R. Burnett	220 & 440 tr. 500	Direct	1,525	884	300 KW.	£113,247	1,572 KW.	78 arc, 149 cbn., mtl. & N.	152=7
22	BATH	Bath Corporation	1890	Francis Teague	100 A.C., 220 D.C.	100~, 1-ph., & direct	1,900	1,073	350 KW.	£159,424	1,948 KW.	194 arc, 5 cbn.	125=4
23	BATLEY	Batley Corporation	1903	S. D. Jones	220 & 440	Direct	850	580	90 KW.	£43,667	526 KW.	25 arc, 50 inc.	72=2
24	BECKENHAM	Beckenham Urban District Council	1900	J. E. Tapper	200 & 400 tr. 500 D.C.	50~, 1-ph.	1,300	706	500 KW.	£129,000	1,784 KW.	17 arc, 34 mtl.	23=5
25	BEDFORD	Bedford Corporation	1894	R. W. L. Phillips	105 & 210	60~, 1-ph.	860	560	..	£94,204	1,767 KW.	17 arc, 616 inc.	137 H.
26	BELFAST	Belfast Corporation	1895	Thos. W. Bloxam	220 & 440 tr. 550	Direct	8,800	6,309	100 A.	£321,704	6,257 KW.	4 arc	4,695
27	BERWICK-UPON-TWEED	Urban Electric Supply Co., Ltd.	1903	J. Hayward	240 & 480	Direct	180	168	96 KW.	£29,700	343 KW.	17 arc, 34 mtl., 8 Nernst	55=2
28	BEXHILL-ON-SEA	Bexhill Corporation	1900	W. T. Le Feuvre Home	220 & 440	Direct	1,150	442	23 KW. for 10 hrs.	£61,000	1,177 KW.	53 arc, 374 cbn., 220 mtl.	80=8
29	BEXLEY	Bexley Urban District Council	1903	C. Mittelhausen	200 A.C., tr. 500 D.C.	50~, 1-ph.	480	299	87 KW.	£16,120*	283 KW.	176 cbn., 110 N.	12=2
30	BIRKDALE	Birkdale District Electric Supply Co., Ltd.	1902	H. Bentham	230 & 460 tr. 550	Direct	390	346	..	£37,080	906 KW.	4 arc, 856 cbn.	6=19½
31	BIRKENHEAD	Birkenhead Corporation	1896	W. Wyld	230 & 460	Direct	1,750	1,012	208 KW.	£144,000	2,851 KW.	58 arc	132=9
32	BIRMINGHAM	Birmingham Corporation	1891	R. A. Chattock	220 & 440 tr. 550	Direct*	17,956	13,685	1,150 KW.	approx. £1,309,424	11,475 KW.	..	1,958= H.
33	BLACKBURN	Blackburn Corporation	1895	P. P. Wheelwright	110, 220 A.C., 220&440 D.C.*	80~, 1-ph., & direct	4,918	2,600	245 KW.	£270,284	2,991 KW.	207 arc, 470 cbn.	580 = H.P.
34	BLACKPOOL	Blackpool Corporation	1893	Charles Furness	200 A.C., 500 D.C.	83~, 1-ph., & direct	4,450	2,584	175 KW.	£201,000	*	279 arc, 464 cbn., 262 N.	156=1,0
35	BLYTH & COWPEN, & BEDLINGTONSHIRE	Northern Counties Electricity Supply Co., Ltd.	1902	C. W. Fairweather J. G. Lovely (Res.)	230 & 460	Direct	500*	625	..	..	541 KW.	..	900 (inc.
36	BOLTON	Bolton Corporation	1894	A. A. Day	100&200 A.C.* 230 & 460 D.C.	83~, 1-ph.,* & direct	7,600	..	..	£345,122	4,795 KW.	..	816=9,2
37	BO'NESS	National Electric Construction Co., Ltd. (for the Corporation)	1905	H. G. Young	230 & 460	Direct	500	172	36.8 KW.	£35,000	500 KW.	33 arc, 137 cbn., 22 mtl., 1 N.	50=332
38	BOOTLE	Bootle Corporation	1899	T. Dawson Clothier	220 & 440 tr. 500	Direct	2,050	1,252	150 KW.	£112,981	1,425 KW.	174 arc : inc. = 654 8-C.P.	1,989 H
39	BOURNEMOUTH	Bournemouth Corporation	1902	I. Bulfin	550	Direct	1,200	1,000	..	£75,000*	..	132 arc	
40	BOURNEMOUTH, POOLE AND CHRISTCHURCH	Bournemouth & Poole Electric Supply Co., Ltd.	1889	E. Ll. Ingram	100&200 A.C.* 250 & 500 D.C.	100~, 1-ph., & direct	4,400	2,459	855 KW.	£432,499	6,165 KW.	112 mtl.	167=47
41	BRADFORD	Bradford Corporation	1889	Thomas Roles	230&460 D.C., 230&400 A.C.,	Direct, & 50 ~, 3-ph.*	1,500 A.C. 8,180 D.C.	6,884	230 KW. lg. 250 KW. tr.	£786,000	6,221 KW.	69 arc, 12 cbn.	1,510= H.P. (exc
42	BRAY	Bray Urban District Council	1892	W. J. U. Sowter	100 & 200	60~, 1-ph.	320	130	..	approx. £17,000	383 KW.	33 arc, 200 cbn., 50 mtl.	
43	BRECHIN	North of Scotland Electric Light & Power Co., Ltd.	1901	Ernest Ames (res.)*	240 & 460	Direct	282	102.8	..	£34,074	404 KW.	251 cbn., 6 N.	21=186
44	BRIDGEND	Bridgend Urban District Council	1903	T. Thomas	200	60~, 2-ph.	300*	100	..	£7,286	147 KW.	15 arc, 368 inc.	8=30 H
45	BRIDGWATER	Bridgwater & District Electric Supply & Traction Co., Ltd.	1904	Harold Walker	230 & 460	Direct	200	70	49 KW.	£23,298	167 KW.	15 arc, 184 inc.	10=21
46	BRIDLINGTON	Bridlington Corporation	1905	Arthur J. Beckett	220 & 440	Direct	440	360	480 A.H.	£35,000	552 KW.	44 arc, 116 cbn., 307 mtl., 21 N.	30=100
47	BRIGHOUSE	Brighouse Corporation	1898	A. Aspinall	110	Direct	70	55	22 KW.	£4,674	134 KW.	..	20=40
48	BRIGHTON	Brighton Corporation	1891	A. Wright (Cons.) J. Christie (Man.)	115, 230, & 460; tr. 550	Direct*	7,200	5,200	400 A.H. lg. 1200 A.H. tr.	£780,645	..	372 arc, 543 cbn. 3,019 mtl.	413 = H.P.
49	BRISTOL	H. Faraday Proctor	1893		105 & 210 A.C. 250 & 500 D.C.	93~, 1-ph.* & direct	9,050	5,942	70 KW.	£769,440	6,729 KW.	693 arc, 9 cbn.	917=7,10
50	BROMLEY (KENT)	Bromley (Kent) Electric Light & Power Co., Ltd.	1898	R. R. Barker	210	Direct	1,620	690	63 KW.	£130,374	1,975 KW.	3 N.	45=112
51	BROUGHTY FERRY	Broughty Ferry Corporation	1902	J. L. Turnbull	230 & 460	Direct	150	84	350 KW.	£18,858	431 KW.	12 arc, 36 cbn., 4 mtl.	15=54
52	BUCKINGHAM	Buckingham Electric Light Co.	1889	T. Gillies (Man.)	220	Direct	70	40	..	..	About 66 KW.	70 cbn., 20 N.	2=1½ H.
53	BUNCRANA	Buncrana Electric Supply Co.	1905	John K. Swan	235 & 470	Direct	125	..	..	..	..	5 arc, 30 cbn.	55 H.P.
54	BURGESS HILL	Burgess Hill & District Electric Supply Co., Ltd.	1906	W. Simms	230	Direct	64	50	..	£4,000	83 KW.	5 arc, 19 inc., 4 Nernst	4=10 H.
55	BURNLEY	Burnley Corporation	1893	Jas. E. Starkie	110,220 & 440 tr. 500	Direct	1,890	1,580	66 KW. lg. 250 KW. tr.	£100,594	1,625 KW.	3 arc, 12 cbn.	197=591
56	BURSLEM	Burslem Corporation	1905	Ashton Bremner	230 & 440	Direct	650	488	70 KW.	£33,444	489 KW.	20 arc, 40 inc.	107=515
57	BURTON-ON-TRENT	Burton-on-Trent Corporation	1894	P. J. Pringle	100 & 200 A.C. tr. 500 D.C.	75~, 1-ph., & direct	1,710	504 lg. 375 tr.	..	£82,579	1,120 KW.	1 arc	125=777
58	BURY (LANCS.)	Bury Corporation	1896	S. J. Watson	220 & 440 tr. 500	Direct	2,260	1,695	154 KW. lg. 225 KW. tr.	£95,000 approx.	1,312 KW.	36 arc, 18×2 inc.	275=2,02
59	BURY ST. EDMUNDS	Bury St. Edmunds Corporation	1900	S. E. Day	200 & 400	Direct	220	200	60 KW.	£30,000	355 KW.	14 arc, 330 cbn., 70 mtl., 19 N.	32=180
60	BUXTON	Buxton Urban District Council	1900	W. J. Leeming	230	Direct	590	355	..	£44,827	..	30 arc	82=112
61	CAMBORNE, REDRUTH AND ILLOGAN	Urban Electric Supply Co., Ltd.	1902	L. A. Hards	240 & 480 tr. 500	Direct	1,025	758	200 KW. lg. 150 KW. tr.	£111,988	470 KW.	2 arc, 220 cbn.	101=1,21
62	CAMBRIDGE	Cambridge Electric Supply Co., Ltd.	1892	R. C. Pierce	200	90~, 1-ph.	2,000	650	..	£126,914	1,787 KW.	1 arc	50=179
63	CAMBUSLANG	Lanark County Council	1905	A. J. Abraham	250	Direct	300	190	53 KW.	£16,991*	168 KW.	30 arc, 6 cbn., 468 mtl., 5 N.	13=43
64	CANTERBURY	Canterbury Corporation	1899	C. A. Blascheck	230 & 440	Direct	900	447	66 KW.	£66,379	782 KW.	12 arc, 137 cbn., 497 mtl.	74=297
		Cardiff Corporation	1894	Arthur Ellis	200 & 400 A.C. & D.C.*	40~, 1-ph., & direct	1,500 A.C. 1,800 m.g.	2,083	850 KW.	£260,000	4,200 KW.	627 arc, 11 cbn., 47 mtl.	438=2,79
		Carlisle Corporation	1899	Sydney F. Allen	230 & 460	Direct	870	818	170 A. lg.	£64,570	1,063 KW.	52 arc, 20 mtl.	76=407

"NEW" LIST OF ELECTRICITY

Private lighting.	Public lighting.	No. and B.H.P. of private motors.	No. and H.P. of traction motors.	Total connections of all kinds.	Percentage increase during year.	Price charged per unit, pence.	System of charging.	Units sold during last complete year.	Remarks.	
4,688 KW.	310 arc, 71 cbn. (281)	652=3604 H.P.	160=4,000 H.P.	11,292 KW.	8.9	Lg. 5½ & 1½; pb. lg. 5½ & 1½; pr. 2½ & 1; tr. 1.18 (corp.), 2½ (co.)	Max.dem., flat rate, cont. & special	5,104,096	Lg. & tr. stn. Supply extended into two counties. *Also A.C., lg. 230 v., pr. 400 v. Data to July 31, 1908.	1
180.5 KW.	29 arc, 8 mtl.	25 H.P. ..	..	501 KW. ..	2	Lg. 6 w. dis. to 25%; pb. lg. arc £18 18s. p.a.; pr. 2 & 2½ ..	Flat rate with dis.	149,580	Data to Dec. 31, 1908	2
980 KW.	18 arc, 60 mtl.	241=999 KW.	46=1,748 H.P.	3,308 KW.	..	Lg. 4 w. dis.; pb. lg. 3; pr. 3 & 1; htg. 1; tr. 1.3	Flat rate with discounts	2,972,612	Lighting & traction. Data to Mar. 31, 1909	3
919 KW.	64 arc, 128 cbn.	67=229 H.P.	..	1,110 KW.	..	Lg. 5 (shops 4); pb. lg. 4; pr. 2½ & 1, or 1½; htg. 1	Max. dem., flat, 2-rate mtr., cont., spl.	511,212	*Supply in bulk at 10,000 volts A.C. from Met. Elec. Supply Co. Data to Mar. 31, 1908	4
470 KW.	1 cbn., 243 N.	14=45 H.P.	..	585 KW.	8.8	Lg. 7 & 4, or 6; pb. lg. 28/-(½a.), 38/-(¾a.); pr. 4 & 1½, or 2½	Max. demand and flat rate	186,028	Data to Dec. 31, 1908	5
428 KW.	19 arc, 44 mtl., 20 N.	31=77 H.P.	..	497 KW.	9	Lg. 6 & 4, or 5 (arc 5); pb. lg. £2¾ per post p.a.; pr. 8 & 2	Max. demand and flat rate	224,771	Data to Mar. 31, 1909	6
265 KW.	20 arc ..	16=24 H.P...	..	296.4 KW.	..	Lg. 4; pb. lg. 2½; pr. 2	Flat rate	83,951	Bulk supply from British Electric Plant Co.	7
285 KW.	..	95 KW.	..	380 KW.	..	Lg. 5½ & 4; pr. 1½ with discounts	Flat rate & sliding scale	..	*C. W. Fairweather (Mgr.). Cons. engrs. Merz & McLellan. Data to Dec. 31, 1908	8
2,020 KW.	..	20=75 H.P.	..	2,095 KW.	9	Lg. 6; pr. 2½ & 1½; htg. 2½ ..	Flat rate, contract and special	458,185	Data to Dec. 31, 1908	9
104 KW.	..	..	..	104 KW. ..	..	Lg. 7 & 5; pr. 4 & 3	Flat rate with dis.	..	Data to May, 1908	10
336 KW.	98 arc, 130 inc., 1 N., 20 mtl.	77=280 H.P.	180=3,000 H.P.	3,644 KW.	..	Lg. 3½ to 2½ (2-rate, 1d.); pb. lg. 1.6; pr. 1.5 to 0.9; tr. 1.5 to 1.0	Sliding scale, 2-rate meter & contract	2,239,347	Lighting and traction. Energy supplied to four tramway undertakings	11
4,095 KW.	19 arc, 34 cbn., 6 mtl.	3690.5 H.P.	36=2,000 H.P. (approx.)	5,647 KW.	59.9	Lg. 5½ to 2½, or 6 & 1½ (2-rate); pb. lg. arc £12; pr. 2 to ½; tr. 1½	Sl. scale w. dis., 2-rate mr., cont. & spl.	4,066,192	Lighting and traction. *Also A.C., lg. 230 v., pr. 400 v. Data to March 31, 1909	12
101 KW.	12 arc ..	20=173 H.P.	..	200 KW.	..	Lg. 4 to 3 & spl. for mills (ch 4½); pr. 1½ to ½; htg. 2	Flat rate, sl. scale, cont. & special	91,827	*Supply in bulk at 7,000 v. A.C. from South Lancs. Tramways Co., Ltd. Data to Mar. 31, 1909	13
1,673 KW.	111 arc, 184 cbn., 20 mtl., 6 N.	79=277 H.P.	32=800 H.P.	2,553 KW.	7	Lg. 3½; pb. lg. 2; pr. 2 to 1½; tr. 1½	Flat rate	1,375,192	Lighting and traction. Data to May 15, 1908	14
293 KW.	..	33=242 H.P.	..	471 KW. ..	8	Lg. 7 & 2½ (4½ max. average); pr. 1½	Max. demand and flat rate	152,949	Data to Dec. 31, 1908	15
120 KW.	..	22=102 H.P.	..	496 KW...	6	Lg. 5 & 3 (2-rate); pr. 2½ to 1¾	Lg. flat rate & 2-rate mtr., pr. sl. sc.	171,372 (estd.)	Data to Mar. 31, 1909	16
761 KW.	19 arc, 494 inc., 54 Nernst	64=493 H.P.	24=600 H.P.	1,476.5 KW.	..	Lg. 4½; pb. lg. 1.99; pr. 3½ to 1; tr. 1½	Flat rate & sliding scale	769,089	Lighting and traction	17
1,425 KW.	88 mtl., 377 N.	60=510 KW.	..	1,986 KW.	15	Lg. 4 w. dis. to 25%; pb. lg. 1.43; pr. 1½ w. dis. to 83⅓%	Sliding scale with discounts	952,437	Data to March 31, 1909	18
1,679 KW.	109 arc ..	125	..	2,286 KW.	8.5	Lg. 7 & 1½, or 3½ dis. 5%; pr. 1½ & sliding scale	Max. dem, flat rate & sl. scale with dis.	1,432,394	Data to Mar. 31, 1909	19
525 KW.	30 arc, 78 cbn. 93 mtl.	26=70 H.P.	..	618 KW.	..	Lg. 5 & 4½; pb. lg. 4½; pr. 2, 2½, & 3	Flat rate w. dis., 2-rate mtr., & special	221,059	Data to Mar. 31, 1909	20
2,572 KW.	78 arc, 149 cbn., mtl. & N.	152=749 KW.	32=752 H.P.	3,004 KW.	9.1	Lg. 6 & 3, or 4½ & 4*; pr. 3 & 1, or 2 to 1½ (day 1); tr. 2 to 1½	Max. dem., flat, sl. sc., 2-rate & cont.	1,057,330	Lighting and traction. *Pb. lg. arc £17½, inc. £3 and £22½. Data to Mar 31, 1909	21
1,948 KW.	194 arc, 5 cbn.	125=400 H.P.	..	2,429 KW.	8.3	Lg. 5; pb. lg. arc £24, inc. £6; pr. 1½	Flat rate, two-rate mtr., & contract.	1,468,535	Supply by company 1890-7. Data to March 31, 1908 ..	22
526 KW.	25 arc, 50 inc.	72=239.4 KW.	32=1,173 H.P.	1,644 KW.	17	Lg. 6 & 2; pb. lg. arc £16; pr. 3 & 1; tr. 1½	Max. demand & flat rate	737,396	Lighting and traction. Data to Mar. 31, 1909	23
1,784 KW.	17 arc, 34 mtl.	23=56 H.P.	..	1,956 KW.	7.6	Lg. 5*; pb. lg. arc £20 p.a.; pr. 2 & 1½	Flat rate	911,840	*Free wiring 5d. per unit plus fittings rentals. Data to Mar. 31, 1909	24
1,067 KW.	17 arc, 616 inc.	137 H.P. ..	..	1,933 KW.	..	Lg. 5½; pr. 1	Flat rate	911,000	.. ..	25
10,257 KW.	4 arc ..	4,695 H.P. ..	464=13,920 H.P.	10,840 KW.	10.4	Lg. 5½ & 1¾, or 3½; pb. lg. arc £15 p.a.; pr. 2½ to 1	Max. demand & flat rate	10,976,384	Lg. & traction. 3-phase 50~ to substns. at 6,000 v. Data to March 31, 1909	26
343 KW.	17 arc, 34 mtl., 8 Nernst	55=280 H.P.	..	576 KW. ..	8	Lg. 6 & 3; pb. lg. arc £17 p.a.; pr. 4 & 1½, spl. to large users	Max. dem., flat rate, 2-rate mtr. & cont.	203,178	Data to December, 1908	27
1,177 KW.	53 arc, 374 cbn., 220 mtl.	30=82 H.P.	..	1,236 KW.	9.9	Lg. 7, 2 & 1½; pb. lg. arc £23, inc. £8 & £4.6; pr. 2*	Max. demand & flat rate	553,816	*Prept. meters 6d. per unit. Data to March 31, 1908 ..	28
983 KW.	176 cbn., 110 N.	12=27 H.P.	32=800 H.P.	1,058 KW.	..	Lg. 6; pb. lg. cbn. £2½, N. £4½ p.a.; pr. 3 to 2 (day), or 6 & 2	Flat rate	562,107	Traction station giving bulk supply for lighting. *Also £5,137 spent on power station	29
1,006 KW.	4 arc, 356 cbn.	6=19½ H.P.	6=105 H.P.	1,029 KW.	12	Lg. 4½; pb. lg., pr. & tr. 2 ..	Flat rate	343,667	Lighting and traction. Data to Dec. 31, 1908	30
3,851 KW.	58 arc ..	152=906 H.P.	..	3,555 KW.	13	Lg. 6, 3 & 1½, or 4; pb. lg. arc £18½; pr. 2 to 1	Max. dem., flat, sl. scale, 2-rate & cont.	1,368,086	Data to Mar. 31, 1909	31
24,475 KW.	..	1,958=14,365 H.P.	See other Table	24,883 KW. (ex. tr.)	32.2	Lg. 4 to 2 (spl. 2½ to 2); pr. 1.35 to 0.7; tr. 1½ to 1	Flat rate with discount	24,406,227	Lighting and traction. Data to Mar. 31, 1909. * Three ph., 25~ at 5,000 v. to substns. and to large consumers	32
4,291 KW.	207 arc, 470 cbn.	580 = 2,324 H.P.†	202=4,655 H.P.	5,270 KW.	10.7	Lg. 6 & 3 (1 hr) or 4; pb. lg. 1.3; pr. 1½ to 0.45; tr. 1.4	Max. dem., flat w.d. sl. scl., 2-rate & t. sw.	4,212,303	Lg. and tr. *Traction, 500 v. D.C. †Including 304 motors=1216 H.P. on hire. Data to Mar. 25, 1909	33
*	279 arc, 464 cbn., 262 N.	156=1,078 H.P.	122=2,214 H.P.	*	*	Lg. 6 & 2, or 5; pb. lg. 3 & 2½; pr. 3 & 1 (htg. 1); tr. 2 to 1½	Max. dem., flat rate and sliding scale	3,053,360	Lg. and tr. *Cannot be stated at present, owing to genl. adoption of mtl. fil. lamps. Data to Mar. 31, 1909	34
1,141 KW.	..	900 KW. (inc. htg.)	..	1,441 KW.	..	Lg. 4, or 1 per 8-c.p. for 5½ hrs.; pr. 2½ to 1½	Flat rate, sl. scale & contract	..	*Used as stand-by; (bulk 900 KW.) fm. Nc. o/T. E. S. Co. Cons. engrs. Merz & Mc Lellan. Data to Dec. 31, 1908	35
10,795 KW.	..	816=9,219 H.P.	See other Table	11,673 KW.	14	Lg. 3½ & 1, or 3½ less 10%; pr. 2 to 1, less 10 per cent.; tr. 1.1	Max. demand & flat rate	10,677,764	*Also three-phase supply at 400 v., 50~. Data to March 31, 1909	36
700 KW.	30 arc, 137 cbn., 22 mtl., 1 N.	50=332 H.P.	..	750 KW. ..	49	Lg. 5 w. dis.; pb. lg. contract; pr. 2½	Flat rate and contract	370,482 (estd.)	Data to May 15, 1909	37
3,625 KW.	474 arc; inc. = 654 8-c.p.	1,989 H.P. ..	325 KW. ..	3,650 KW.	..	Lg. 6 & 1½, or 3½; pb. lg. 2; pr. 2 to 1; tr. 1½ to 1	Max. demand and flat rate	2,674,858	Lighting and traction. Data to Mar. 31, 1909	38
..	132 arc ..	..	See other Table	..	..	Pb. lg. 2	Flat rate	1,890,580	Public lighting & traction station (92½% of output for traction.) *Station plant and cables. Data to Mar. 31, '09	39
1,665 KW.	112 mtl.	167=477 H.P.	52=1,300 H.P.	7,522 KW.	9.9	Lg. 7 & 3½, or 6; pr. 2 & 2½; tr. 1½	Max.dem., flat, w.d., 2-rate, cont. & spl.	3,005,714	Lighting and traction. *Also 400 v. A.C., and traction 550 v. D.C. Data to December 31, 1908	40
12,921 KW.	69 arc, 12 cbn.	1,510=7,209 H.P. (exc. bulk)	See other Table	12,924 KW. ex. tr. & blk.	5.02	Lg. 4 w. dis.†; pb. lg. arc £12½; pr. 2 to ¾; htg. 2 to 1; tr. 1½ (2½ nt.)	Flat rate, max. dem. sl. scale & time sw.	17,000,000 (approx.)	Lg. & tr. Lamps free (one p. 30 u.). *50~3-ph. at 6,600 v. to substns. Tr. 500 D.C. †Also 7d. & 1d. m.d. Data to 31/3/09	41
423 KW.	33 arc, 200 cbn., 50 mtl.	..	..	420 KW. ..	4	Lg. & pr., 6 & 3½; pb. lg., arc £15, inc. £2 p.a.	Max. demand ..	167,200	District residential, no industries, hence no power load. Data to March 31, 1909	42
1,004 KW.	251 cbn., 5 N.	21=136 H.P.	..	546 KW. ..	3	Lg. 6 & 4, or 5½; pb. lg. 2.9; pr. 4 & 1½, or 2½	Max. dem., flat rate, 2-r. & cont.	113,265	* F. Barritt Hills, Engineer & Manager	43
1,007 KW.	15 arc, 368 inc.	8=30 H.P....	..	20; KW.	..	Lg. 4½ & 4; pb. lg. 2.8; pr. 1½; htg. 2½	Flat rate	96,680	* Energy purchased in bulk from S. Wales E. P. D. Co. at 1.375d. per unit	44
1,007 KW.	15 arc, 184 inc.	10=21 H.P.	..	183 KW.	..	Lg. 7 & 2, or 4½; pr. 3 & 1, or 2	Max. demand & flat rate	41,000	.. ..	45
2,702 KW.	44 arc, 116 cbn., 307 mtl., 21 N.	30=100 H.P.	..	707 KW.	18	Lg. 5 to 3½; pb. lg. arc £15, N. £5, inc. £5, £4 & £3; pr. 2 to 1½	Flat rate & sliding scale	324,600	Data to Mar. 31, 1909	46
1,004 KW.	..	20=40 H.P.	..	170 KW.	4	Lg. 5; pr. 4, 3 & 2	Flat rate	52,482	Gas power. Data to Mar. 31, 1909	47
..	372 arc, 543 cbn. 3,019 mtl.	413 = 1,704 H.P.†	80=2,400 H.P.	11,105 KW.	4.2	Lg. 6 & 2; pb. lg. 1½; pr. 1½ (t. sw. 1); tr. 1½	Max. dem., flat, sl. sc., t. sw., cont. & spl.,	8,037,711	Lg. & tr. *8,000 v. 3-ph. 50~ to substations. †Including 155 motors=772 H.P. on hire. Data to Mar. 31, 1909	48
2,939 KW.	693 arc, 9 cbn.	917=7,103 H.P.	..	12,282 KW.	..	Lg. 4½ w. dis. to 3; pb. lg. arc £21 £14½ per lp. p.a.; pr. 1½ w. dis. to 1.2	Flat rate w. dis., 2-rate, time sw., special	7,650,074	*Also 50~, 3-phase, at 210 volts. Data to Mar. 25, 1908	49
2,775 KW.	3 N.	45=112 H.P.	..	2,774 KW.	6	Lg. 7 & 4, or 6; pr. 4 & 1, or 2½	Max. demand, flat rate & 2-r. mtr.	883,809	Bulk supply to Chislehurst at 2,000 volts D.C. Data to Dec. 31, 1908	50
491 KW.	12 arc, 36 cbn., 4 mtl.	15=54 H.P.	..	491 KW.	8.5	Lg. 6; pb. lg. 2½; pr. 4	Flat rate	122,715	Data to May 15, 1908	51
1,066 KW.	70 cbn., 20 N.	2=1½ H.P. ..	..	67 KW. ..	..	Lg. 7 w. dis.; pb. lg. contract ..	Flat rate	..	Part gas power	52
..	5 arc, 30 cbn.	55 H.P. ..	..	..	..	Lg. 5; pb. lg. contract; pr. 1½..	Flat rate with discount	..	.. ..	53
99 KW.	5 arc, 19 inc., 4 Nernst	4=10 H.P. ..	..	97 KW.	..	Lg. 6; pr. 5	Flat rate	25,000	Suction gas power; overhead mains	54
3,145 KW.	3 arc, 12 cbn.	197=591 H.P.	46=3,460 H.P.	4,650 KW.	10	Lg. 3½; pb. lg. 1½; pr. 1½ & 1; tr. 1½	Flat rate & max. demand w. dis.	3,148,875	Lighting and traction. Data to Mar. 31, 1909	55
599 KW.	20 arc, 40 inc.	107=515 H.P.	..	..	..	Lg. 7 & 2, or 5; pb. lg. 3; pr. 2 to ½	Max. demand & flat, pr. sl. scale	584,994	Data to Dec. 31, 1908	56
1,530 KW.	1 arc ..	125=777 H.P.	40=1,000 H.P.	1,770 KW.	5.98	Lg. 5, or 6 & 3; pb. lg. 3; pr. 3 & 1, or 2 to 1½; tr. av. 1.37	Max. demand, flat rate, & sl. scale	1,527,841	Lighting and traction. *Pr., 67.5% of total on restricted-hour system, 1d. to ¾d. p. u. Data to Mar. 31, 1909	57
2,952 KW.	36 arc, 18×2 inc.	275=2,026 H.P.	See other Table	3,025 KW.	20	Lg. 3½, 5½, 2½; pb. lg. arc £11½ & £13½ inc., £1½; pr. 1½, 1 & ½; tr. 1	Flat rate & sliding scale	3,217,360	Lighting and traction. Data to Mar. 31, 1909	58
5,505 KW.	14 arc, 330 cbn., 70 mtl., 19 N.	32=180 H.P.	..	542 KW.	13.4	Lg. 6 (dis. to 85%) pb. lg. arc £14, inc. £3; pr. 6 to 3½* w. dis.	Flat rate with discounts & special	327,857 (approx.)	*Corp. waterworks, 50 H.P., supplied at 1.25d. per unit average.	59
..	80 arc ..	32=112 H.P.	..	898 KW. ..	..	Lg. 6, 4 & 3, or 7 & 3; pb. lg. arc £20 p.a.; pr. 3 & 1¾	Max. dem., flat & sl. scale with dis.	315,139	Max. load in September; load through season heavier than in winter. Data to Mar. 31, 1908	60
1,000 KW.	2 arc, 220 cbn.	101=1,219 H.P.	20=500 H.P.	1,850 KW.	14	Lg. 7 & 4, or 6; pr. 4 & 1, or 2½; tr. 1½	Max. demand, flat rate & contract	1,993,422	Lighting and traction. Data to Dec. 31, 1908	61
1,767 KW.	1 arc ..	50=179 H.P.	..	1,920 KW.	7	Lg. 6 on 200 v., 7 on 100 v., with spcl. discounts; pr. 3½ to 1½	Flat rate with discounts, & contract	660,158	Data to Dec. 31, 1908	62
1,338 KW.	20 arc, 6 cbn., 468 mtl., 5 N.	13=43 H.P.	..	237 KW.	..	Lg. 4; pb. lg. 2; pr. 2	Flat rate	100,000 est.	*Also destructor, £7,000. Energy obtained from refuse almost entirely. Data to May 15, 1909	63
2,042 KW.	12 arc, 137 cbn., 497 mtl.	74=297 H.P.	..	1,045 KW.	6.6	Lg. 7 & 1½, or 4½; pb. lg. arc £25, inc. £3½ p.a.*; pr. 1½	Max. demand and flat rate	664,251	*Two tant. 33 C.P. each, or two Osram 25 C.P., or one cbn., 25 C.P. Data to Mar. 31, 1909.	64
7,000 KW.	627 arc, 11 cbn., 47 mtl.	438=2,798 H.P.	..	7,146 KW.	17	Lg. 7 & 2, or 3½; pb. lg. arc £14, flame £20, p.a.§; pr. 4 & 1, or 1½	Max. dem., flat rate, sl. scl., 2-rate mtr.	4,297,150	*Also 100 v. A.C. †Tr. dept. sup. 3 [illegible] D.C. at 0.8d. p.u. §Inc. £2 14s. [illegible]	
1,338 KW.	29 arc, 99 mtl.	70=405 H.P.	30=450 H.P.	1,610 KW.	22.0	Lg. 5 to 4*; pb. lg. arc £21 15s 4d &	Max. demand, flat,	1,149,031	Lighting and traction. *Also £7 pe[illegible]	

37	BOURNE		Co., Ltd. (for the Corporation)									23 mtl., 1 N.	
38	BOOTLE		Bootle Corporation	1899	T. Dawson Clothier	220 & 440 tr. 500	Direct	2,050	1,252	150 KW.	£112,981	1,425 KW.	174 arc : inc. = 654 8-C.P.	1,989
39	BOURNEMOUTH		Bournemouth Corporation	1902	I. Bulfin	550	Direct	1,200	1,000		£75,000*		132 arc	
40	BOURNEMOUTH, POOLE AND CHRISTCHURCH		Bournemouth & Poole Electric Supply Co., Ltd.	1889	F. Ll. Ingram	100&200A.C.* 250 & 500D.C.	100~, 1-ph., & direct	4,400	2,459	355 KW.	£432,499	6,165 KW.	112 mtl.	167=4
41	BRADFORD		Bradford Corporation	1889	Thomas Roles	230&460 D.C., 230&400 A.C.,	Direct, & 50 ~, 3-ph.*	1,500 A.C. 8,180 D.C.	6,884	230 KW. lg. 250 KW. tr.	£766,000 approx.	6,221 KW.	69 arc, 12 cbn.	1,510 H.P. (ex
42	BRAY		Bray Urban District Council	1892	W. J. U. Sowter	100 & 200	60~, 1-ph.	320	130		£17,000	383 KW.	33 arc, 200 cbn., 50 mtl.	
43	BRECHIN		North of Scotland Electric Light & Power Co., Ltd.	1901	Ernest Ames (res.)*	240 & 480	Direct	282	102.8		£34,074	404 KW.	251 cbn., 5 N.	21=18
44	BRIDGEND		Bridgend Urban District Council	1908	T. Thomas	200	60~, 2-ph.	300*	100		£7,286	147 KW.	15 arc, 368 inc.	8=30
45	BRIDGWATER		Bridgwater & District Electric Supply & Traction Co., Ltd.	1904	Harold Walker	230 & 460	Direct	200	70	49 KW.	£23,298	167 KW.	15 arc, 184 inc.	10=21
46	BRIDLINGTON		Bridlington Corporation	1905	Arthur J. Beckett	220 & 440	Direct	440	300	480 A.H.	£35,000	552 KW.	44 arc, 116 cbn., 307 mtl., 21 N.	30=10
47	BRIGHOUSE		Brighouse Corporation	1898	A. Aspinall	110	Direct	70	55	22 KW.	£4,674	134 KW.		20=40
48	BRIGHTON		Brighton Corporation	1891	A. Wright (Cons.) J. Christie (Man.)	115, 230, & 460 ; tr. 550	Direct*	7,200	5,200	400 A.H.lg. 1200A.H.tr.	£780,645		372 arc, 543 cbn. 3,019 mtl.	413 = H.P.
49	BRISTOL		Bristol Corporation	1893	H. Faraday Proctor	105 & 210A.C. 250 & 500D.C.	93~, 1-ph.* & direct	9,050	5,942	70 KW.	£769,440	6,729 KW.	693 arc, 9 cbn.	917=7,
50	BROMLEY (KENT)		Bromley (Kent) Electric Light & Power Co., Ltd.	1898	R. B. Barker	210	Direct	1,620	690	68 KW.	£130,374	1,975 KW.	3 N.	45=11
51	BROUGHTY FERRY		Broughty Ferry Corporation	1902	J. L. Turnbull	230 & 460	Direct	150	84	250 KW.	£18,858	431 KW.	12 arc, 36 cbn., 4 mtl.	15=54
52	BUCKINGHAM		Buckingham Electric Light Co.	1889	T. Gillies (Man.)	220	Direct	70	40			About 66KW.	70 cbn., 20 N.	2=1½
53	BUNCRANA		Buncrana Electric Supply Co.	1905	John K. Swan	235 & 470	Direct	125					5 arc, 80 cbn.	55 H.P.
54	BURGESS HILL		Burgess Hill & District Electric Supply Co., Ltd.	1906	W. Simms	230	Direct	64	50		£4,000	68 KW.	5 arc, 19 inc., 4 Nernst	4=10
55	BURNLEY		Burnley Corporation	1893	Jas. E. Starkie	110,220 & 440 tr. 500	Direct	1,890	1,580	66 KW. lg. 250 KW.tr.	£100,594	1,625 KW.	3 arc, 12 cbn.	197=5
56	BURSLEM		Burslem Corporation	1905	Ashton Bremner	220 & 440	Direct	650	438	70 KW.	£33,444	489 KW.	20 arc, 40 inc.	107=5
57	BURTON-ON-TRENT		Burton-on-Trent Corporation	1894	P. J. Pringle	100 & 200A.C. tr. 500 D.C.	75~, 1-ph., & direct	1,710	504 lg. 375 tr.		£82,579	1,120 KW.	1 arc	125=7
58	BURY (LANCS.)		Bury Corporation	1896	S. J. Watson	220 & 440 tr. 500	Direct	2,260	1,695	154 KW.lg. 225 KW.tr.	£95,000 approx.	1,312 KW.	36 arc, 18×2 inc.	275=2,
59	BURY ST. EDMUNDS		Bury St. Edmunds Corporation	1900	S. E. Day	200 & 400	Direct	220	200	60 KW.	£30,000	355 KW.	14 arc, 330 cbn., 70 mtl., 19 N.	32=18
60	BUXTON		Buxton Urban District Council	1900	W. J. Leeming	230	Direct	590	355		£44,327		30 arc	32=11
61	CAMBORNE, REDRUTH AND ILLOGAN		Urban Electric Supply Co., Ltd.	1902	L. A. Hards	240 & 480 tr. 500	Direct	1,025	758	200 KW.lg. 150 KW. tr.	£111,983	470 KW.	2 arc, 220 cbn.	101=1,
62	CAMBRIDGE		Cambridge Electric Supply Co., Ltd.	1892	R. C. Pierce	200	90~, 1-ph.	2,000	650		£125,914	1,787 KW.	1 arc	50=17
63	CAMBUSLANG		Lanark County Council	1905	A. J. Abraham	250	Direct	200	120	53 KW.	£16,291*	163 KW.	20 arc, 6 cbn., 468 mtl., 5 N.	13=48
64	CANTERBURY		Canterbury Corporation	1899	C. A. Blascheck	220 & 440	Direct	900	447	66 KW.	£66,379	782 KW.	12 arc, 137 cbn., 497 mtl.	74=29
65	CARDIFF		Cardiff Corporation	1894	Arthur Ellis	200& 400 A.C. & D.C.*	40~, 1-ph.,† & direct	1,560 A.C. 1,800 m.g.	2,683	850 KW.	£260,000	4,200 KW.	627 arc, 11 cbn., 47 mtl.	488=2,
66	CARLISLE		Carlisle Corporation	1899	Sydney T. Allen	230 & 460, tr. 500	Direct	870	813	170 A. lg. 700 A. tr.	£64,570	1,063 KW.	52 arc, 20 mtl.	70=49
67	CARLOW		J. Alexander	1890	O. St. J. McKee	100 & 200	70~, 1-ph., & direct	115		40 KW. for 4 hrs.		68 KW.	13 arc, 84 inc.	1=67
68	CARNARVON		National Electric Construction Co., Ltd.*	1905	D. O. Evans	230 & 460	Direct	200	119	72 A.				25=12
69	CATERHAM		Urban Electric Supply Co., Ltd.	1903	Henry Joseph	240 & 480	Direct	178	75	86.4 KW.	£34,220	331 KW.		76.3 KW ht
70	CHAGFORD		Chagford & Devon Electric Light Co., Ltd.	1891	Geo. H. Reed	100	99~, 1-ph.	22	19				22 mtl.	
71	CHELMSFORD		Electric Supply Corporation, Ltd.	1890	J. Eustace	100 & 200A.C., 110 D.C.	100~, 1-ph., & direct	860	575		£61,959	659 KW.	21 arc, 290 Nernst	59=21
72	CHELTENHAM & CHARLTON KINGS		Cheltenham Corporation	1895	Walter J. Bache	100 & 200 tr. 550	100~, 1-ph., & D.C. for tr.	2,880	1,231	165 KW.	£154,076	2,070 KW.	388 arc, 19 cbn.	37=91
73	CHEPSTOW		Chepstow Electric Lighting & Power Co., Ltd.	1904	W. H. Scott	230	Direct	100		46 KW.				
74	CHESHAM		Chesham Electric Light & Power Co., Ltd.	1904	R.J.J.Swan(Res.)	230 & 460	Direct	250	175	100 A. for 2½ hrs.	£27,072	169 KW.	9 arc, 120 cbn., 23 mtl., 62 N.	50=25
75	CHESTER		Chester Corporation	1896	S. E. Britten	210 & 420, tr. 500	Direct	1,823	1,320	140 KW.	£117,924	1,676 KW.	197 arc, 358 cbn. 158 mtl., 183 N.	119=5
76	CHESTERFIELD		Chesterfield Corporation	1901	R. L. Acland	240 & 480 tr. 500	Direct	1,000	493 l. & p. 300 tr.	150 KW.	£56,878	1,192 KW.	24 arc, 48 mtl.	153=7
77	CHICHESTER		Chichester Electric Light & Power Co., Ltd.	1909 (June10)	R. V. Weare (Res.)*	240 & 480	Direct	200						
78	CHISLEHURST		Chislehurst Electric Supply Co., Ltd.	1899	R. R. Baker	210	Direct	220*	92	53 KW.	£27,117	437 KW.		
79	CHISWICK		Chiswick Electricity Supply Corporation, Ltd.	1900	A. W. Money	220 & 440	Direct	921	586.5	182 KW.		1,195 KW.		100=6
80	CHURCH STRETTON		Church Stretton Electric Supply Co., Ltd.	1904	G. Payne	200 & 400	Direct	100						1=2 H
81	CLACTON-ON-SEA		Clacton-on-Sea Urban District Council	1906	H. W. Everitt	230 & 460	Direct	200		200 A. for 3 hrs.	£10,000			
82	CLECKHEATON		Cleckheaton Urban District Council	1902	A. Pickersgill	230 & 460 tr. 550	Direct	800	475	115 KW.	£26,463		5 arc, 32 mtl.	52=24
83	COATBRIDGE AND AIRDRIE		Coatbridge and Airdrie Electric Supply Co., Ltd.	1894	W. D. Morgan	240&480D.C., 400 A.C.*	Direct and 25~,3-ph.,	1,700†	1,200	480 A.H.		710 KW.	10 arc, 20 mtl., 140 N.	1,900 H
84	COLCHESTER		Colchester Corporation	1898	A. R. Sillar	210 & 420 tr. 500	Direct	2,030	881		£80,234	1,517 KW.	110 mtl., 242 Nernst	50=13
85	COLNE		Colne Corporation	1901	A. G. Cooper	240 & 480 tr. 540	Direct	1,130	460		£46,730	514 KW.		142=3
86	COLWYN BAY		Colwyn Bay Urban District Council	1901	A. R. Tudman	220 & 440	Direct	420	350	44 KW.	£40,184	523 KW.	75 arc, 12 posts mtl., 1 Nernst	15=94
87	CORK		Cork Electric Tramways and Lighting Co., Ltd.	1898	H. H. Nalder	230 & 460 tr. 500	Direct*	2,350	1,450	300 KW.	£322,022†	1,872 KW.	90 arc	290=2,0
88	COVENTRY		Coventry Corporation	1895	Geo. Tough	200	50~, 2-ph.	3,900	2,885		£287,871	1,770 KW.	117 arc	546=5,0
89	CREWE		Crewe Corporation	1900	H. H. Denton	230 & 460	Direct	660	420	150 KW.	£54,154	799 KW.	30 arc, 748 cbn. posts	48=170
90	CROMER		Cromer Electric Supply	1903	Edgar Hesketh	240 & 480	Direct	180	145		£32,817	357 KW.	10 arc, 20 cbn.	21=90
91	CROYDON		Croydon Corporation	1896	Alec. C. Cramb	200A.C.,230 & 460 D.C.	60~, 1-ph. & direct	5,750	3,295	156 KW.	£343,664	5,391 KW.	419 arc, 229mtl.	178=8
92	DALKEITH		Electric Supply Corporation Ltd.	1904	K. A. Scott-Moncrieff*	225 & 450	Direct	110	55	58 KW.	£15,700	110 KW.	27 arc, 16 mtl., 14 N.	22=52
93	DARLINGTON		Darlington Corporation	1900	J. R. P. Lunn	230 & 460 tr. 500	Direct	1,470	1,018	368 KW.	£70,040	1,209 KW.	55 arc	162=1,
94	DARTFORD		Dartford Urban District Council	1901	J. D. Pember	230 & 460 tr. 500	Direct	700	529	50 KW. lg. 125 KW. tr.	£41,264	396 KW.	6 arc, 48 cbn., 69 mtl., 135 N.	54=387
95	DARTMOUTH		Urban Electric Supply Co., Ltd.	1902	G. E. Smith	240 & 480	Direct	330	226.5	168 KW.	£55,013	588.5 KW.	10 arc, 186 cbn., 18 mtl.	29=198
96	DARWEN		Darwen Corporation	1899	Chas. Garnett	230 & 460 tr. 500	Direct	900	620	117 KW.	£57,846	681.6 KW.	19 arc, 1 cbn., 32 mtl., 111 N.	113=41
97	DERBY		Derby Corporation	1898	T. P. Wilmshurst	230 & 460 D.C. 200 A.C.tr.500	40~, 1-ph. & direct	5,000	2,100	375 A.	£270,000	4,351 KW.	186 arc, 518 cbn.	155=2,0
98	DEVONPORT		Devonport Corporation	1901 tr. 1902 lg.	J. W. Spark	230, 460 & 500	Direct	1,800	1,053	270 A. lg., 1,000 A. tr.	£120,502	987 KW.	20 arc, 1 inc.	43=114
99	DEWSBURY		Dewsbury Corporation	1894	B. H. Campion	220 & 440, tr. 500	Direct	1,050	852 lg., 420 tr.	360 A.H.lg., 150 KW.tr.	£57,655	774 KW.	31 arc, 32 cbn., 2 mtl.	114=5
100	DISS		Suffolk Electricity Supply Co., Ltd.	1898	Napier Prentice	200	Direct	48	28	40 KW.		40 KW.		5=8 H
101	DOLLAR		Electric Supply Corporation, Ltd.	1904	K. A. Scott-Moncrieff*	225	Direct	40	17.1	15 KW.	£7,000	59.3 KW.	26 mtl., 8 Nernst	4=1½
102	DONCASTER		Doncaster Corporation	1900	E. S. Bayner	230 & 460 tr. 500	Direct	1,200	825	23 KW.	£63,885	966 KW.	8 arc, 16 mtl.	49=275
103	DORKING		Dorking Electricity Supply	1904	Henry Joseph	240	Direct	150	141	49 KW.	£37,884	491 KW.		39 KW. ht
104	DOVER		Dover Corporation	1895	L. W. Woodman	100 & 200A.C. 500 D.C.	100~, 1-ph. & direct	1,850	670	77 KW.	£186,280	1,573 KW.	64 arc ; inc. & N. = 444 8-C.P.	47=370
105	DUBLIN		Dublin Corporation	1892	Mark Ruddle	lg. 200, pr. 346	50~, 1-ph. & 3-ph.	6,000	3,490		£596,000	4,944 KW.	567 arc, 135 mtl.	364=1,6
106	DUDLEY		Dudley Corporation	1899	Charles E. Savage	230 &460 tr. 500	Direct	1,600	1,575		£88,000	985 KW.	66 arc, 223 cbn., 30 mtl.	110=75
107	DULVERTON		Dulverton Electric Lighting Co., Ltd.	1904	Edwards & Armstrong	230	Direct	60	30	50 KW.	£3,780	63 KW.	35 cbn.	8=12
108	DUMBARTON		Electric Supply Corporation, Ltd.	1906	K. A. Scott-Moncrieff*	240 & 480 tr. 500	Direct	940	732	50 KW.	£42,000	180.6 KW.		60=546
109	DUMFRIES		Dumfries Electric Supply Co., Ltd.	1906	Talfourd Ely, Manager	230	Direct	200	47	125 KW.		60 KW.		24=26.
110	DUNDEE		Dundee Corporation	1898	H. Richardson	200 & 400 tr. 550.	Direct	3,010	2,800	70 KW.	£179,186	3,251 KW.	86 arc	404=1,7
111	EALING		Ealing Corporation	1894	J.Douglas Knight	102 & 204	40~, 1-ph.	1,770	1,126	94 KW.	£186,799		72 arc, 779 mtl.	49=196
112	EASTBOURNE		Eastbourne Corporation	1882 & 1900*	J. K. Brydges	200	50~, 1-ph.	1,950	1,006		£186,922	3,213 KW.	96 arc, 7×2 mtl.	111=29
113	EAST HAM		East Ham Corporation	1901	W. C. Ullmann	240 & 480 tr. 500	Direct	1,995	1,341		£128,511 (Mar., 1907)	1,524 KW.	200 arc, 84 cbn., 25 mtl.	76=234
114	EBBW VALE		Ebbw Vale Urban District Council	1906	Wm. Horsfall*	230 & 460	Direct	Bulk supply†	135		£15,500 approx.	183 KW.	24 arc, 408×2 mtl.	5=9 H
115	ECCLES		Eccles Corporation	1898	H. W. Angus	200 A.C., tr. 500 D.C.	50~, 1-ph.	910	277KW.lg., 111 KW. tr.	tr. 150 KW.	£48,413	340 KW.	27 arc, 303 posts	47=196
116	EDINBURGH		Edinburgh Corporation	1895	F. A. Newington	230 A.C., 230 & 460 D.C.	50~, 1-ph. & direct	15,217	11,187	3,600 A.H.				
			North Metropolitan Electric	1907	E. T. Rutsven	240 & 415	50~, 3-ph.	950	194		£18,768	135.5 KW.	36 flame arc	10=23

	23 mtl., 1 N.						pr. 2½	contract	(est.)		
425 KW.	474 arc : inc. = 654 8-C.P.	1,989 H.P. ..	825 KW. ..	3,650 KW.	..	Lg. 6 & 1½, or 3½ ; pb. lg. 2 ; pr. 2 to 1 ; tr. 1½ to 1	Max. demand and flat rate	2,674,858	Lighting and traction. Data to Mar. 31, 1909	38
..	132 arc ..	..	See other Table	..	..	Pb. lg. 2	Flat rate	1,890,580	Public lighting & traction station (92½% of output for traction.) *Station plant and cables. Data to Mar. 31, '09	39
,165 KW.	112 mtl.	167=477 H.P.	52=1,300 H.P.	7,523 KW.	9.9	Lg. 7 & 3½, or 6 ; pr. 2 & 2½ ; tr. 1⅝	Max.dem.,flat,w.d., 2-rate, cont. & spl.	3,005,714	Lighting and traction. *Also 400 v. A.C., and traction 550 v. D.C. Data to December 31, 1908	40
221 KW.	69 arc, 12 cbn.	1,510=7,209 H.P. (exc. bulk)	See other Table	12,924 KW. ex. tr. & blk.	5.02	Lg. 4 w. dis.† ; pb. lg. arc £12½ ; pr. 2 to 2⅜ ; htg. 2 to 1 ; tr. 1½(2⅜ nt.)	Flat rate, max. dem. sl. scale & time sw.	17,000,000 (approx.)	Lg. & tr. Lamps free (one p. 30 u.). *50~3-ph. at 6,600 v. to substns. Tr. 500 D.C. †Also 7d. & 1d. m.d. Data to 31/3/09	41
383 KW.	33 arc, 200 cbn., 50 mtl.	..	..	420 KW. ..	4	Lg. & pr., 6 & 3½ ; pb. lg., arc £15, inc. £2 p.a.	Max. demand ..	167,260	District residential, no industries, hence no power load. Data to March 31, 1909	42
404 KW.	251 cbn., 5 N.	21=186 H.P.	..	546 KW. ..	3	Lg. 6 & 4, or 5½ ; pb. lg. 2.9 ; pr. 4 & 1½, or 2½	Max. dem., flat rate, 2-r. & cont.	113,365	* F. Barritt Hills, Engineer & Manager	43
47 KW.	15 arc, 368 inc.	8=30 H.P....	..	20? KW.	..	Lg. 4½ & 4 ; pb. lg. 2.8 ; pr. 1⅝ ; htg. 2½	Flat rate	96,680	* Energy purchased in bulk from S. Wales E. P. D. Co. at 1.875d. per unit	44
67 KW.	15 arc, 184 inc.	10=21 H.P.	..	183 KW.	..	Lg. 7 & 2, or 4½ ; pr. 3 & 1, or 2	Max. demand & flat rate	41,000	.. ..	45
552 KW.	44 arc, 116 cbn., 307 mtl., 21 N.	80=100 H.P.	..	707 KW.	18	Lg. 5 to 3½ ; pb. lg. arc £15, N. £5, inc. £5, £4 & £3 ; pr. 2 to 1½	Flat rate & sliding scale	324,600	Data to Mar. 31, 1909	46
84 KW.	..	20=40 H.P.	..	170 KW.	4	Lg. 5 ; pr. 4, 3 & 2	Flat rate	52,482	Gas power. Data to Mar. 31, 1909	47
..	372 arc, 543 cbn. 3,019 mtl.	413 = 1,704 H.P.†	80=2,400 H.P.	11,105 KW.	4.2	Lg. 6 & 2 ; pb. lg. 1⅔ ; pr. 1½ (t. sw. 1) ; tr. 1½	Max. dem., flat, sl. sc., t. sw., cont. & spl.,	8,037,711	Lg. & tr. *8,000 v. 3-ph. 50~ to substations. †Including 155 motors=772 H.P. on hire. Data to Mar. 31, 1909	48
729 KW.	693 arc, 9 cbn.	917=7,103 H.P.	..	12,282 KW.	..	Lg. 4½ w. dis. to 3 ; pb. lg. arc £21 £14½ per lp. p.a. ; pr. 1½ w. dis. to 1.5	Flat rate w. dis., 2-rate, time sw., special	7,650,074	*Also 53~, 3-phase, at 210 volts. Data to Mar. 25, 1908	49
975 KW.	3 N.	45=112 H.P.	..	2,774 KW.	6	Lg. 7 & 4, or 6 ; pr. 4 & 1, or 2½	Max. demand, flat rate & 2-r. mtr.	883,809	Bulk supply to Chislehurst at 2,000 volts D.C. Data to Dec. 31, 1908	50
331 KW.	12 arc, 36 cbn., 4 mtl.	15=54 H.P.	..	491 KW.	8.5	Lg. 6 ; pb. lg. 2½ ; pr. 4	Flat rate	122,715	Data to May 15, 1908	51
out 66 KW.	70 cbn., 20 N.	2=1½ H.P. ..	..	67 KW. ..	..	Lg. 7 w. dis. ; pb. lg. contract ..	Flat rate	..	Part gas power	52
..	5 arc, 30 cbn.	55 H.P. ..	..	..	..	Lg. 5 ; pb. lg. contract ; pr. 1½ ..	Flat rate with discount	..	.. ..	53
88 KW.	5 arc, 19 inc., 4 Nernst	4=10 H.P. ..	..	97 KW.	..	Lg. 6 ; pr. 5	Flat rate	25,000	Suction gas power; overhead mains	54
625 KW.	3 arc, 12 cbn.	197=591 H.P.	46=3,460 H.P.	4,650 KW.	10	Lg. 3½ ; pb. lg. 1½ ; pr. 1⅝ & 1 ; tr. 1½	Flat rate & max. demand w. dis.	3,148,875	Lighting and traction. Data to Mar. 31, 1909	55
89 KW.	20 arc, 40 inc.	107=515 H.P.	..	..	..	Lg. 7 & 2, or 5 ; pb. lg. 3 ; pr. 2 to ⅓	Max. demand & flat, pr. sl. scale	584,994	Data to Dec. 31, 1908	56
1,120 KW.	1 arc ..	125=777 H.P.	40=1,000 H.P.	1,770 KW.	5.98	Lg. 5, or 6 & 3 ; pb. lg. 3 ; pr. 3 & 1, or 2 to 1⅓ ; tr. av. 1.37	Max. demand, flat rate, & sl. scale	1,527,841	Lighting and traction. *Pr., 67.5% of total on restricted-hour system, 1d. to ¾d. p. u. Data to Mar. 31, 1909	57
312 KW.	36 arc, 18×2 inc.	275=2,026 H.P.	See other Table	3,025 KW.	20	Lg. 3⅜, 3½, 2⅔ ; pb. lg. arc £11½ & £13½ inc., £1½ ; pr. 1⅔, 1 & ⅔ ; tr. 1	Flat rate & sliding scale	3,217,360	Lighting and traction. Data to Mar. 31, 1909	58
355 KW.	14 arc, 330 cbn., 70 mtl., 19 N.	32=180 H.P.	..	542 KW.	13.4	Lg. 6 (dis. to 6⅔%) pb. lg. arc £14, inc. £2 ; pr. 3 to 2⅓* w.dis.	Flat rate with discounts & special	327,857 (approx.)	*Corp. waterworks, 50 H.P., supplied at 1.25d. per unit average.	59
..	30 arc ..	82=112 H.P.	..	898 KW. ..	..	Lg. 6, 4 & 3, or 7 & 3 ; pb. lg. arc £20 p.a. ; pr. 3 & 1⅔	Max. dem., flat & sl. scale with dis.	315,139	Max. load in September ; load through season heavier than in winter. Data to Mar. 31, 1908	60
170 KW.	2 arc, 220 cbn.	101=1,219 H.P.	20=500 H.P.	1,850 KW.	14	Lg. 7 & 4, or 6 ; pr. 4 & 1, or 2½ ; tr. 1½	Max. demand, flat rate & contract	1,993,422	Lighting and traction. Data to Dec. 31, 1908	61
787 KW.	1 arc ..	50=179 H.P.	..	1,920 KW.	7	Lg. 6 on 200 v., 7 on 100 v., with spcl. discounts ; pr. 3½ to 1⅓	Flat rate with discounts, & contract	660,158	Data to Dec. 31, 1908	62
163 KW.	20 arc, 6 cbn., 468 mtl., 5 N.	13=43 H.P.	..	237 KW.	..	Lg. 4 ; pb. lg. 2 ; pr. 2	Flat rate	100,000 est.	*Also destructor, £7,000. Energy obtained from refuse almost entirely. Data to May 15, 1909	63
732 KW.	12 arc, 197 cbn., 497 mtl.	74=297 H.P.	..	1,045 KW.	6.6	Lg. 7 & 1⅓, or 4½ ; pb. lg. arc £25, inc. £2½ p.a.* ; pr. 1½	Max. demand and flat rate	664,251	*Two tant. 23 C.P. each, or two Osram 25 C.P., or one cbn., 25 C.P. Data to Mar. 31, 1909.	64
2,200 KW.	637 arc, 11 cbn., 47 mtl.	488=2,793 H.P.	..	7,146 KW.	17	Lg. 7 & 2, or 3½ ; pb. lg. arc £14, flame £20, p.a.§ ; pr. 4 & 1, or 1½	Max. dem., flat rate, sl. scl., 2-rate mtr.	4,297,150	*Also 100 v. A.C. †Tr.dept. sup. 3-ph. 6600 v., 50~ & 400 v., D.C. at 0.8d. p.u. §Inc. £2 14s. & £4 1s. p.a. Data 31/3/09	65
1,063 KW.	52 arc, 20 mtl.	70=497 H.P.	30=450 H.P.	1,610 KW.	22.0	Lg. 5 to 4* ; pb. lg. arc £21 13s 4d & £15 ; pr. 1(restd. hrs. 3½) ; tr. 2 to 1½	Max. demand, flat, sl. sc., 2 rate & spl.	1,143,091	Lighting and traction. *Also £7 per KW. m.d. & 3d. per unit. Data to Mar. 31, 1909	66
98 KW.	13 arc, 84 inc.	1=67 H.P. ..	..	117 KW. ..	..	Lg. 7½ w. dis. (=6 to 3½) ; pb. lg. contract	Flat rate with discounts	68,479	5 miles overhead mains to Carlow. Water power; steam plant at C. as stand-by	67
..	..	25=120 H.P.	..	315 KW. ..	38	Lg 5 ; pr. 2½, w. discounts ..	Flat rate	94,496	*Leased from the Corporation. Data to Mar. 25, 1909 ..	68
331 KW.	..	76.3 KW. inc. htg.	..	407 KW. ..	12.7	Lg. 7 & 4, or 6 ; pr. 4 & 1⅓, or 2½	Max. demand & flat rate	82,708	Data to Dec. 31, 1909	69
..	22 mtl.	..	..	..	..	Lg. 6 ; pb. lg. inc. £2 p.a. ..	Flat rate	..	Water power. Data to April 20, 1909	70
559 KW.	21 arc, 290 Nernst	59=211 H.P.	..	890 KW.	11	Lg. 5½ to 4⅓ ; pb lg. arc £25½, N. £3 3s. p.a. ; pr. 3	Sliding scale ..	473,885	Data to Dec. 31, 1908	71
1,070 KW.	388 arc, 19 cbn.	37=91 H.P.	40=1,240 H.P.	2,452 KW. (ex. tr.)	2.3	Lg. 5½, 4 & 2 ; pb. lg. 3 ; pr. 2 ; tr. 1.6, 1.1, & 0.75	Max. demand, flat rate & contract	..	Lighting and traction. Lighting A.C., Tramway Co. supplied with D.C. Data to Mar. 31, 1909	72
..	..	..	..	..	..	Lg. 7 ; pr. 3	Flat rate	..	.. ..	73
869 KW.	9 arc, 120 cbn., 23 mtl., 62 N.	50=250 H.P.	..	373 KW. ..	14	Lg. 5 ; pb. lg. contract ; pr. 4 & 1½, or 3	Flat rate, contract & max. demand	203,000	Data to Dec. 31, 1908	74
3,676 KW.	197 arc, 358 cbn. 158 mtl., 188 N.	119=592 H.P.	27=664 H.P.	3,497 KW.	15.86	Lg. 3½ ; pb. lg. inc. £3,880 p.a. ; pr. 1½ & 1 ; 0.89 p.u. + £982 p.an.	Flat rate w. dis. & contract	1,788,881	Lighting and traction. Data to Mar 24, 1909	75
1,192 KW.	24 arc, 48 mtl.	153=790 H.P.	30=760 H.P.	1,735 KW.	8.5	Lg. 6 & 3, or 4, less 10% ; pb. lg. arc £12½ ; pr. 1⅓, 1⅓ & 1 ; tr. 1⅓	Max. demand & flat rate with dis.	1,102,528	Lighting and traction. Data to Mar. 31, 1909	76
..	..	..	..	..	..	.. ..	.. .. ..	..	*Horace Boot, cons. eng. Diesel oil-engine plant. ..	77
487 KW.	..	..	..	482 KW. ..	8	Lg. 8 & 4, or 7 ; pr. 4	Max. demand and flat rate	113,629	*Bulk supply from Bromley at 2,000 v. Data to Dec. 31, 1908	78
1,195 KW.	..	100=611 H.P.	..	1,841 KW.	..	Lg. 5 (shops 4) ; pr. 2 to 1⅞ ..	Flat rate with discounts	874,346	Data to Dec. 31, 1908	79
..	..	1=2 H.P. ..	..	64 KW. ..	..	Lg. 6 ; pr. 5 & 1½..	Flat rate	19,278	Suction gas plant	80
..	..	..	..	..	..	Lg. 5 ; pr. 3	Flat rate	..	.. ..	81
..	5 arc, 32 mtl.	52=246 H.P.	600 H.P. ..	768 KW. ..	9.6	Lg. 4 ; pb. lg. 2 ; pr. 2 & 1 ; tr. 1.5 to 1.3	Flat rate & sliding scale	716,365	Lighting and traction. Data to Mar. 31, 1909	82
1,610 KW.	10 arc, 20 mtl., 140 N.	1,900 H.P. ..	..	2,448 KW.	..	Lg. 4	Flat rate & sliding scale	1,636,814	Lg. & tr. *Traction 550 v. D.C. †Portion of supply now taken in bulk from Clyde Valley Electric Power Co.	83
2,417 KW.	110 mtl., 242 Nernst	50=133 KW.	36=816 H.P.	2,098 KW.	12.8	Lg. 4 to 3½ ; pb. lg. 2½ & 1⅔ ; pr. 4 to 2 ; bulk, 1½ to 1 ; tr. 1½	Flat rate with discounts	1,344,177	Lighting and traction. Data to Mar. 31, 1909	84
1,614 KW.	..	142=372 H.P.	24=672 H.P.	1,297 KW.	6.5	Lg. 6 & 2½, or 4½ ; pr. 3 & 1, or 2½ ; tr. 2 to 1½	Max. demand and flat rate	672,114	Lighting and traction. Motor-gen. 125 K.V.A., 50~, 3-ph., for transmission. Data to Mar. 31, 1909	85
2,128 KW.	75 arc, 12 posts mtl., 1 Nernst	15=94 H.P.	..	676.5 KW.	11	Lg. 5 ; pb. lg. 2 ; pr. 3	Flat rate	207,943 (1907)	Data to Mar. 31, 1909	86
4,772 KW.	90 arc ..	290=2,050 H.P.	70=1,380 H.P.	4,435 KW.	10	Lg. 5, 4 & 3 ; pb. lg. arc £15 p.a. ; pr. 2 & 1½	Flat rate determined by max. demand	3,550,457	Lighting and traction. *6,000 v. 50~ 3-ph. trans. †Lg. £149,004 ; tr. £173,018. Data to Dec. 31, 1908	87
1,070 KW.	117 arc	546=5,029 H.P.	..	6,801 KW.	19	Lg. 6, 3 & 1, or 4½ ; pb. lg. £800 p.a. ; pr. 1⅔ to 1	Max. demand and flat rate	4,559,105	Data to Mar. 31, 1909	88
1,099 KW.	90 arc, 748 cbn. posts	48=170 H.P.	..	1,022 KW.	6	Lg. 6 & 3, or 4 ; pb. lg. 2½ ; pr. 3 to 1⅓	Max. demand and flat rate with dis.	596,901	Data to Mar. 31, 1909	89
1,757 KW.	10 arc, 20 cbn.	21=30 KW..	..	895 KW. ..	7	Lg. 7 & 4, or 6* ; pb. lg. arc £17 p.a. ; pr. 4 & 1⅓, or 2½	Max. demand and flat rate with dis.	97,429	*Slot meter 7d. per unit, inc. meter rent. Data to Dec. 31, 1908	90
2,091 KW.	419 arc, 229 mtl.	178=860 H.P.	200=7,000 H.P.	11,953 KW.	8	Lg. 7 & 1⅓, or 4½ (bamns 2⅔) ; pr. (t. sw.) 3 & 1, or 2⅓ ; tr. 2 to 1⅓*	Max. dem., flat, 2 rate, cont. w. dis., t.sw.	6,040,551	Lighting and traction. *Pb. lg. arc £16 ; inc. £3 8s 6d., £2 18s. 4d. p.a. Htg., 1½d. Data to Mar. 31, 1909	91
1,010 KW.	27 arc, 16 mtl., 14 N.	22=52½ H.P.	..	165 KW. ..	5.4	Lg. 4½ less 10 % ; pb. lg. 3 ; pr. 3 ; htg. 1⅓	Flat rate	87,925	*Resident Engineer, H. A. Tulloch. Data for 1908 ..	92
2,009 KW.	55 arc ..	162=1,231.3 H.P.	32=800 H.P.	2,289 KW.	13.5	Lg. 4 & 1⅓, or 8⅓ ; pb. lg. arc £15 p.a.; pr. 1⅓ to 1⅔* ; tr. 1⅓	Flat rate, max. demand & sl. scale	1,521,197	Lighting and traction. *Also £4 per KW. p.a. and ⅓d. per unit. Data to Mar. 31, 1909	93
1,096 KW.	6 arc, 43 cbn., 69 mtl., 185 N.	54=387 H.P.	12=600 H.P.	1,105 KW.	2.5	Lg. 7 & 2, or 4* ; pb. lg. arc £21, £10½ ; pr. 2⅓ to 1⅓ ; tr. 2 to 1⅓	Max. demand and flat rate w. dis.	904,599	Lg. & tr. *Prept. meters, 6d. †N. (½d.) or 2 mtl., £5 ; N. (¼d.) or cbn. £3 3s. Data to Mar. 31, 1909	94
1,145 KW.	10 arc, 186 cbn., 18 mtl.	29=198 H.P.	..	758 KW. ..	8.8	Lg. 7 & 3, or 6 ; pb. lg. £550 p.a. ; pr. 4 & 1⅓, or 2½	Max. demand and flat rate	360,148	Data to Dec. 31, 1908	95
1,616 KW.	19 arc, 1 cbn., 32 mtl., 111 N.	113=413 H.P.	32=1,120 H.P.	1,074 KW.	9.4	Lg. 4⅓ ; pb. lg. 3 ; pr. 2 ; tr. 1⅓	Flat rate and contract	660,812	Lighting and traction, with destructor. Data to Mar. 31, 1908	96
2,121 KW.	186 arc, 518 cbn.	155=2,092 H.P.	98=2,000 H.P.	7,758 KW.	5	Lg. 6 to 2⅓ ; pb. lg. inc. 2 ; pr. 3 to 1 ; tr. 1⅓*	Max. demand and sliding scale*	3,048,664	Lg. & tr. *Special max. demand rates for lg. and pr. ; p'. lg., arc £23 (⅓nt. £10). Data for 1907-8	97
1,767 KW.	20 arc, 1 inc.	43=114.5 H.P.	76=1,900 H.P.	2,676 KW.	5.2	Lg. 4* ; pb. lg. arc £22½, inc. £3⅔ ; pr. 1⅔ ; tr. 3 to 1.4	Flat, sl. sc., 2-rate, cont., t. sw., spl.	1,722,462	Lighting and traction. *By 2-rate mtr., 4 & 1½d. Data to Mar. 31, 1909	98
2,774 KW.	31 arc, 32 cbn., 2 mtl.	114=560 H.P.	24=600 H.P.	1,800 KW.	20	Lg. 5½ & 3, or 4 ; pb.lg. 5½ & 3 ; pr. 2⅓ & 1 (t. sw. 1) ; tr. 1.6, 1.5 & 1.4	Max. demand and flat rate	1,035,745	Traction supply to Yorks. (W.D.) Elec. Trys., and to Dewsbury & Ossett Trys. Data to Mar. 31, 1909	99
9 KW.	...	5=8 H.P. ..	..	45 KW. ..	..	Lg. 8 & 6 ; pr. 6 to 3	Max. demand and flat rate	..	Gas power	100
93 KW.	26 mtl., 8 Nernst	4=1⅓ H.P. ..	..	60.6 KW.	6.7	Lg. 6 ; pb. lg. 3 ; pr. 3	Flat rate & sliding scale	16,190	Overhead mains, bare copper. *Resident engineer, J. B. Mitchell. Data for 1908	101
238 KW.	8 arc, 16 mtl.	49=275 H.P.	50=1,250 H.P.	2,133 KW.	..	Lg. 5, 4⅓ & 3 ; pb. lg. £140 p.a.; pr. 2 to 1⅓ ; tr. 1⅓	Max. demand and flat rate	937,652	Lighting and traction. Data to Mar. 31, 1909	102
1 KW.	..	29 KW. (inc. htg.)	..	530 KW.	7.7	Lg. 7 & 4, or 6 ; pr. 2⅓	Max. demand & flat rate	130,646	Data to Dec. 31, 1908	103
3,178 KW.	64 arc ; inc. & N.=444 8-C.P.	47=370 H.P.	21=1,100 H.P.	2,940 KW.	..	Lg. 7 & 3, or 6 w. dis.* ; pr. 2⅓ ; tr. 2⅔	Max. demand & flat rate w. discount	1,101,070	Lighting and traction. *Pb. lg. arc £20 p.a., or 2⅓d. p.u., inc. (12 C.P.) £1 12s. p.a. Data to Mar. 31, 1909	104
4,144 KW.	567 arc, 125 mtl.	304=1,670 H.P.	..	6,788 KW.	20	Lg. 5⅓ to 3 ; pb. lg. arc £22, inc. £3⅓ p.a.; pr. 1⅔	Flat rate with discounts	3,875,675	Data to Dec. 1908	105
2,565 KW.	56 arc, 223 cbn., 50 mtl.	110=703 H.P.	See other Table	1,687 KW. (ex. tr.)	11	Lg. 6 & 1⅓, or 4 ; pb.lg. 2 (arc £20 p.a.); pr. 6 & 1 ; tr. 3 to 1, av.1.8	2-rate meter, flat rate, & prept.	2,023,207	Lighting and traction. Data to Mar. 31, 1908	106
2 KW.	35 cbn. ..	3=12 H.P. ..	..	72 KW. ..	100	Lg. 6 ; pb. lg. £35 ; pr. 4 to 1..	Flat rate & sliding scale	19,300	Data to Sept. 30, 1903	107
1,616 KW.	..	60=346 H.P.	16	651 KW. (ex. tr.)	37	Lg. 4⅓ ; pr. spl. ; htg. 1⅓ ; tr. sl. scale	Max. demand, flat rate & sl. scale.	1,074,332	Lighting and traction station. *Resident engineer, W. A. Ritchie. Data for 1908	108
1,000 KW.	..	24=85.5 H.P.	..	95 KW. ..	60	Lg. 7 ; pr. 3	Flat rate, with discounts	26,934	Lighting station. Data to Dec. 31, 1908	109
4,001 KW.	86 arc ..	404=1,703 KW.	124=5,880 H.P.	8,549 KW.	24	Lg. 3½ to 2 ; pb. lg. arc £15, £12, £8 p.a. ; pr. 2⅔ max. ; tr. 1⅓	Flat rate with dis. ; spl. m.d. for pr.	4,719,085	Lighting and traction. Data to April 20, 1908	110
..	73 arc, 779 mtl.	49=196 H.P.	..	4,867 KW.	8.4	Lg. 4⅓ (arc 4), or 7 & 2 ; pb. lg. arc £18 14s., inc. £3.1.6* ; pr. 1⅓	Flat rate & max. demand	1,497,107	*Osram lamps supplied free for pb. lg. Decrease in units sold due to mtl. lamps. Data to Mar. 31, 1909	111
3,005 KW.	96 arc, 7×2 mtl.	111=396 H.P.	..	5,524 KW.	6.5	Lg. 5⅓, hotels 7 & 4† (arc 4⅓) ; pb. lg. arc £20 8s.p.a.; pr. 2⅓ to 1	Flat rate, max. demand, & 2-rate mtr.	1,930,899	*Purchased from Company in 1900. †Also double tariff, 5½ night, 2½ day. Data to Mar. 31, 1909	112
4,104 KW.	200 arc, 84 cbn., 35 mtl.	76=2344 H.P.	60=2,000 H.P.	3,519 KW.	5.2	Lg. 5 & 3, or 3⅔ ; pb. lg. arc £18 ; pr. 2 & 1⅓ ; tr. 1.5	Max. dem., flat, sl. scale, contract, etc.	2,116,000 (1908)	Lighting and traction. *Including heaters. Data to Mar. 31, 1908	113
3,663 KW.	26 arc, 408×2 mtl.	5=9 H.P. ..	..	203 KW. ..	40	Lg. 4⅓ (slot meters 5) ; pr. 3 ..	Flat rate, sl. scale & contract	165,000	*R. P. Wilson, Cons. eng. †Bulk supply from Ebbw Vale Steel, Iron & Coal Co. Data to Mar. 31, 1909	114
..	27 arc, 306 posts	47=196 H.P.	..	795 KW. (ex. tr.)	..	Lg. 7 & 3, or 6 ; pb. lg. 3⅓ ; pr. 3⅓ to 1 ; tr. 1⅓	Max. dem., flat, sl. scale rate, & cont.	1,050,054	Lighting and traction. Tramways leased to Salford Corporation. Data to March 31, 1909	115
5 KW.	317 arc, 1 cbn.	166=953 H.P.	..	1,335 KW.	4.2	Lg. 5 ; pr. 3	Flat rate	1,000,000	*C. J. Barnett, resident eng. ..	116

[illegible]	[illegible]	[illegible] Ltd.	[illegible]	A. [illegible] Moncrieff*	230	Direct ..	40	17.1	12 kw.	£7,000	[illegible] kw.	[illegible] 8 Nernst	4=
102	DONCASTER	Doncaster Corporation ..	1900	E. S. Rayner ..	230 & 460 tr. 500	Direct ..	1,200	925	23 kw.	£62,885	988 kw.	8 arc, 16 mtl.	49=
103	DORKING	Dorking Electricity Supply ..	1904	Henry Joseph ..	240	Direct ..	150	141	49 kw.	£37,884	491 kw.	..	39
104	DOVER	Dover Corporation	1895	L. W. Woodman	100 & 200 A.C. 500 D.C.	100~, 1-ph. & direct	1,850	670	77 kw.	£186,589	1,578 kw.	64 arc; inc. & N. = 444 8-C.P.	47=
105	DUBLIN	Dublin Corporation	1892	Mark Ruddle ..	lg. 200, pr. 346	50~, 1-ph. & 3-ph.	6,000	3,490	..	£526,000	4,944 kw.	557 arc, 125 mtl.	364=
106	DUDLEY	Dudley Corporation	1899	Charles E. Savage	230 & 400 tr. 500	Direct ..	1,600	1,575	..	£88,000	985 kw.	56 arc, 222 cbn., 90 mtl.	110=
107	DULVERTON	Dulverton Electric Lighting Co., Ltd.	1904	Edwards & Armstrong	230	Direct ..	60	30	50 kw.	£3,780	62 kw.	35 cbn. ..	8=
108	DUMBARTON	Electric Supply Corporation, Ltd.	1906	K. A. Scott-Moncrieff*	240 & 480 tr. 500	Direct ..	940	722	50 kw.	£43,000	180.6 kw.	..	60=
109	DUMFRIES	Dumfries Electric Supply Co., Ltd.	1906	Talfourd Ely, Manager	230	Direct ..	200	47	125 kw.	..	60 kw.	..	24=
110	DUNDEE	Dundee Corporation	1898	H. Richardson ..	200 & 400 tr. 550	Direct ..	3,010	2,800	70 kw.	£179,135	3,221 kw.	86 arc ..	404=
111	EALING	Ealing Corporation	1894	J. Douglas Knight	102 & 204	40~, 1-ph.	1,770	1,126	94 kw.	£196,799	..	72 arc, 779 mtl.	49=
112	EASTBOURNE	Eastbourne Corporation ..	1882 & 1900*	J. K. Brydges ..	200	50~, 1-ph.	1,950	1,096	..	£185,922	3,213 kw.	96 arc, 7×2 mtl.	111=
113	EAST HAM	East Ham Corporation ..	1901	W. C. Ullmann	240 & 480 tr. 500	Direct ..	1,925	1,341	..	£122,511 (Mar., 1907)	1,524 kw.	200 arc, 84 cbn., 25 mtl.	76=
114	EBBW VALE	Ebbw Vale Urban District Council	1906	Wm. Horsfall* ..	230 & 460	Direct ..	Bulk supply†	135	..	£15,500	188 kw.	24 arc, 408×2 mtl.	5=9
115	ECCLES	Eccles Corporation	1898	H. W. Angus ..	200 A.C., tr. 500 D.C.	50~, 1-ph.	910	377 kw. lg., 111 kw. tr.	tr. 150 kw.	£48,413 approx.	540 kw.	27 arc, 303 posts	47=
116	EDINBURCH	Edinburgh Corporation ..	1895	F. A. Newington	230 A.C., 230 & 460 D.C.	50~, 1-ph. & direct	15,217	11,137	3,600 A.H.	..	..	..	
117	EDMONTON	North Metropolitan Electric Power Supply Co.	1907	E. T. Ruthven Murray (E.in Chf.)*	240 & 415	50~, 3-ph.	250 (trans.)†	104	..	£13,763 (Dec. 31, '08)	135.5 kw.	26 flame arc	10=
118	ELLAND	Elland Urban District Council	1903	A. V. Wardrop ..	240 & 480	Direct ..	280	195	150 kw.	£15,000	334 kw.	24 arc, 22 cbn., 56 mtl.	51=
119	EPSOM	Epsom Urban District Council	1902	H. F. Foster ..	230 & 460	Direct ..	560	181	37 kw.	£38,000 (estimated)	480 kw.	12 arc, 119 cbn., 300 mtl.	13=
120	ENFIELD	North Metropolitan Electrical Power Distribution Co., Ltd.	1906	A. H. Bennett* (Res.)	240 & 480	Direct ..	200	122	110 kw.	£29,404	227 kw.	..	137
121	ERITH & DISTRICT ..	Erith Urban District Council	1903	A. Covency ..	350, 400 & 200 tr. 500 D.C.	50~3 & 1-ph.	1,350	720	..	£67,885*	913 kw.	19 arc, 511 cbn., 84 N., 7×2 mdn.	110=
122	EXETER & HEAVITREE	Exeter Corporation	1889*	H. D. Munro ..	100 A.C., tr. 500 D.C.	60~, 1 & 2 ph., & D.C.	1,500	940	..	£110,000	1,768 kw.	39 arc, 491 mtl.	103=
123	EXMOUTH	Electric Supply Corporation, Ltd.	1904	K. A. Scott-Moncrieff*	225 & 450	Direct ..	300	69	80 kw.	£27,870	256 kw.	..	14=4
124	FALKIRK	Falkirk Corporation	1903	J. McMillan ..	230 & 460	Direct ..	500	260	150 kw.	£34,500	634 kw.	51 arc, 100 mtl., 10 N.	60=
125	FALMOUTH	Electric Supply Corporation, Ltd.	1906	K. A. Scott-Moncrieff*	240 & 480	Direct ..	300	75.3	86 kw.	£28,300	173 kw.	..	16=
126	FAREHAM	Fareham Urban District Council	1890	A. Blake ..	105	125~, 1-ph.	135	85	..	£12,888	168	27 arc, 111 cbn., 9 mtl.	2=½
127	FARNWORTH	Farnworth Urban District Council	1901	R. B. Leach ..	230 & 440 tr. 500	Direct ..	550	520	160 A.	£41,933	377 kw.	133 arc, 186 inc.	460
128	FAVERSHAM	Faversham Corporation ..	1904	G. Sommerville	230 & 460	Direct ..	270	110	46 kw.	£22,442	150 kw.	10 arc, 8 cbn., 20 mtl., 100 N.	10=
129	FELIXSTOWE & WALTON	Suffolk Electricity Supply Co., Ltd.*	1899	Napier Prentice	200	Direct ..	200	165	100 kw.	..	300 kw.	40 arc, 10 mtl.	15=
130	FESTINIOG	Yale Electric Power Co. ..	1900	T. P. O. Yale ..	220, 230 & 500	Direct ..	720	..	210 A.H.	£20,000	238 kw.	170 arc & inc.	2=5
131	FINCHLEY	Finchley Urban District Council	1903	Edward Calvert	250 & 500	Direct ..	1,000	539	200 kw.	£76,000	1,264 kw.	2,644 inc. (equiv. 8-C.P.)	35=
132	FLADBURY	Fladbury Electric Light and Power Co., Ltd.	1900	J. Wm. Wagstaff	220	Direct ..	40	..	..	..	..	6 inc. ..	1=4
133	FLEETWOOD	Fleetwood Urban District Council*	1900	Oswin Hansom ..	200 & 400	Direct ..	350	220	40 kw.	£21,500	840 kw.	21 arc ..	50=
134	FOLKESTONE	Folkestone Electricity Supply Co., Ltd.	1898	T. Hesketh ..	210 & 420	Direct ..	1,750	1,091	..	£200,445	..	88 arc, 438 cbn. mtl. & N.	
135	FOLKESTONE AND DISTRICT	Folkestone District Electric Light & Power Co., Ltd.	1899	W. G. F. Webster	110	Direct ..	100	50	10 kw.	£6,000	50 kw.	..	7=1
136	FOOTS CRAY	Foots Cray Electricity Supply Co., Ltd.	1907	A. Wright (Manager)	103	50~, 1-ph.	*	..	..	£10,000	..	..	
137	FORT WILLIAM	Fort William Electric Lighting Co., Ltd.	1896	I. Reid	150 & 300	Direct ..	120	190	30 kw.	£11,091	200 kw.	6 arc, 60 inc.	2=4
138	FRINTON-ON-SEA ..	Frinton-on-Sea & District Electric Light & Power Co., Ltd.	1903	W. Hockley ..	230 & 460	Direct ..	60	40	45 kw.	£7,500	83 kw.	..	4=1
139	FROME	Frome Electricity Supply ..	1904	F. H. Merritt ..	240 & 480	Direct ..	525	277	65 kw.	£45,235 (sanctioned)	254 kw.	10 arc, 258 N.	185=
140	GALWAY	Galway Electric Co., Ltd. ..	1889	Percy A. Spalding (Eng. & Man.)	110	Direct ..	145	122	67.5 kw.	£14,500	179 kw.	20 arc, 148 cbn.	6=1
141	CATESHEAD, DURHAM, JARROW, ETC.	County of Durham Electrical Pr. Distribution Co., Ltd.	1901	A. S. Esslemont (Manager)*	240 & 480 D.C. 440 A.C.; tr 500	40~, 3-ph. and direct	†	..	..	£449,618	1,722 kw.	75 cbn., 2 mtl., =6 kw.	12,19
142	GILLINGHAM	Gillingham Corporation ..	1897	A. D. Chalmers	220 D.C., 230 & 100 A.C.*	Direct & 50~, 3-ph.	950	390	..	£72,000	585 kw.	2 arc, 142 cbn., 364 mtl.	33=
143	GLASGOW	Glasgow Corporation	1892	W. W. Lackie ..	250 & 500	Direct ..	30,145	22,186	600 kw.	£1,685,084	34,514 kw.	837 arc ..	3,853
144	GLOSSOP	Urban Electric Supply Co., Ltd.	1903	C. E. Knowles ..	240 & 480	Direct ..	425	325	60 kw.	£52,143	293 kw.	45 Nernst ..	225
145	GLOUCESTER	Gloucester Corporation ..	1900	F. H. Corson ..	220 & 440, tr. 500-550	Direct ..	2,000	1,041	200 kw.	£90,334	1,253 kw.	175 arc, 7 mtl., 3 N.	96=
146	GODALMING	Urban Electric Supply Co., Ltd.	1902	R. S. Robertson	240 & 480	Direct ..	380	237	45 kw.	£56,727	740 kw.	10 arc, 240 inc., 1 N.	26=
147	GORSEINON	Gorseinon Electric Light Co., Ltd.	1894	D. Powell ..	200	Direct ..	60	55	..	£3,800	260 kw.	57 inc. ..	1=3
148	GOSPORT & ALVERSTOKE	Gosport & Alverstoke Electric Lighting Co., Ltd.	1907	J. Fereday Glenn	240 & 480	Direct ..	400*	..	..	..	119 kw.	..	3=10
149	GOVAN	Govan Corporation	1900	T. C. Parsons ..	250 & 500	Direct ..	1,950	1,446	225 kw.	£130,766	1,772 kw.	215 arc ..	4,759
150	GRANTHAM	Urban Electric Supply Co., Ltd.	1903	J. E. Edmundson	240 & 480	Direct ..	380	237	650 A.H.	..	750 kw.	..	310
151	GRAVESEND .. .	Gravesend Corporation ..	1902	C. F. McInnes ..	230	Direct ..	700	453	630 A.H.	£49,603	..	27 arc ..	10=8
152	GRAYS THURROCK ..	Grays Thurrock Urban District Council	1901	E. D. Long ..	230 & 460	Direct ..	380	160	97 kw.	£23,680	339 kw.	201 inc., 45 N., 19 mtl.	24=7
153	GREAT CROSBY AND WATERLOO	Liverpool District Lighting Co., Ltd.	1897	W. M. Horsfall	220	Direct ..	485	317	160 A.	£57,234	1,565 kw.	24 mtl. 78 N.	15=5
154	GREENOCK	Greenock Corporation ..	1899	J. A. Robertson	250 & 500 D.C. 110 A.C.; tr 500	50~, 3-ph. and direct	3,500	2,080	275 kw. lg. 370 kw. tr.	£162,000*	1,916 kw.*	50 arc, 4 mtl., 2 N.	367= H.K.
155	GRIMSBY & DISTRICT	Grimsby Corporation	1901	W. A. Vignoles ..	230 & 460	Direct ..	1,716	1,248	..	£93,026	1,567 kw.	82 arc, 34 cbn., 43 mtl.	151= H.K.
156	GUERNSEY	Guernsey Electric Light and Power Co., Ltd.	1900	C. Lakin - Smith	210 & 420	Direct ..	1,070	861	600 kw.	£127,836	838 kw.	16 mtl. ..	1,857
157	GUILDFORD	Guildford Electric Supply Co., Ltd.	1896	H. L. Alderton ..	215 & 430	Direct ..	700	340	27 kw.	£53,271	*	6 mtl. ..	60=
158	HALIFAX	Halifax Corporation	1894	W. M. Rogerson	230 & 460, tr. 550	Direct ..	4,750	2,850	630 kw.	£255,742	3,754 kw.	61 arc, 78 cbn., 4 mtl., 2 N.	421=
159	HAMILTON	Edmundson's Electricity Corporation (Lessees)	1903	T. M. Colson ..	240 & 480	Direct ..	380	339	150 kw.	£61,571	480 kw.	66 arc, 8 N.	93=
160	HANDSWORTH	Handsworth Urban District Council	1905	F. A. Nixon ..	240, tr. 500	Direct ..	1,050	469	143 kw.	£70,402	522 kw.	124 arc, 246 cbn.	85=
161	HANLEY (STAFFS.) ..	Hanley Corporation	1894	C. H. Yeaman ..	100 & 200 (pr. 200 & 400)	100~, 1-ph.	2,300	1,102	..	£109,496	2,153 kw.	71 arc, 459 cbn.	129=
162	HARROGATE	Harrogate Corporation ..	1897	G. Wilkinson ..	100 & 200	50~, 1-ph.	2,150	840	..	£122,591	2,643 kw.	91 arc, 203 cbn., 257 mtl.	110=
163	HARROW	Harrow Electric Light and Power Co., Ltd.	1896	J. A. B. Horsley	220 & 440	Direct ..	854	332	66 kw.	£33,198	1,153 kw. (inc. motors)	..	68
164	HARTLEPOOL	Cleveland & Durham County Elec. Pr. Supply Co., Ltd.	1904	A. B. Gridley (Mgr.) T. Mitchell (Res.)	230 & 460	Direct ..	400*	410	..	..	150 kw.	..	
165	HASTINGS	Hastings Corporation ..	1882	R. F. Ferguson ..	200 & 400	100~, 1-ph.	1,850	615	30 kw.	£165,240	1,313 kw.	113 arc, 107 cbn., 2 m l.	21=6
166	HAWICK	Urban Electric Supply Co., Ltd.	1901	A. N. Rye ..	240 & 480	Direct ..	600	496	50 kw.	£65,432	529 kw.	12 arc, 3 cbn., 433×2 mtl.	660
167	HEBBURN & FELLING	Northern Counties Elec. Spy. Co., Ltd. (Owned by U.D.C.)	1903	W. Bates and W. R. Rogers	230 & 460 D.C. 440 A.C.	Direct & A.C.	3,400*	2,428	..	..	474 kw.	..	3,30
168	HEBDEN BRIDGE ..	Hebden Bridge Urban District Council	1904	J. W. Garside ..	240 & 480	Direct ..	215	190	500 A.H.	£11,500	150 kw.	36 mtl. ..	17=6
169	HECKMONDWIKE ..	Heckmondwike Urban District Council	1901	Geo. H. Carter ..	230 & 460 tr. 550	Direct ..	1,000	716	198 kw.	£40,548	410 kw.	10 arc, 147 cbn., 47 mtl.	95=
170	HENDON	Hendon Electric Supply Co., Ltd.	1907	B. G. Drummond	240 & 415	50~, 3-ph.	Bulk sply.	124	..	£32,000	..	..	
171	HEREFORD	Hereford Corporation	1899	W. T. Kerr ..	230 & 440	Direct ..	810	345	50 kw.	£42,000	633 kw.	4 arc ..	90=3
172	HERTFORD	North Metropolitan Elec. Pr. Distribution Co., Ltd.	1901	J. M. Bowman (Res.)*	230 & 460	Direct ..	300†	158	40 kw.	£11,090	338 kw.	9 arc, with 18 inc.	8=41
173	HESTON & ISLEWORTH	Heston and Isleworth Urban District Council	1904	Percy E. Rycroft	240 & 480	Direct ..	500	386	200 kw.	£57,399	792 kw.	51 arc, 288 mtl.	45=3
174	HEXHAM	Hexham and District Electric Supply Co., Ltd.	1906	Wilfred Hall (Cons. Eng.)	120 lg., 220 & 440 pr.	40~, 3-ph.	100	86	..	£8,484	52 kw.	..	9=43
175	HEYWOOD	Heywood Corporation ..	1900	Jas. Stott ..	200 & 400 tr. 500	Direct ..	900	99	100 kw.	£26,986	231.4 kw.	4 arc ..	66=2
176	HICH BARNET	North Metropolitan Elec Pr. Distribution Co., Ltd.	1900	H. Barnard Sale (Res.)*	230 & 460	Direct ..	500	312	..	£14,444	351 kw.	18 arc, 169 mtl., 169 inc.	36=
177	HICH WYCOMBE ..	Wycombe (Borough) Electric Light & Power Co., Ltd.	1898	W. E. Brandreth	210 & 420	Direct ..	880	580	110 kw.	£100,284	1,007 kw.	12 arc, 20 mtl., 350 N.	155=
178	HINDHEAD AND DIST.	Hindhead & District Electric Light Co., Ltd.	1900	T. B. Reader ..	220 & 440	Direct ..	175	70	27 kw.	£19,956	150 kw.	..	7=28
179	HITCHIN	Electric Supply Corporation, Ltd.	1906	K. A. Scott-Moncrieff*	240 & 480	Direct ..	200	61.2	77 kw.	£18,930	188 kw.	..	7=13
180	HOLYHEAD	Holyhead Urban District Council	1904	P. Williams ..	200 & 400	Direct ..	220	149	240 kw.	£21,405	212 kw.	9 arc, 452 cbn.	8=54
[illegible]	[illegible]	Honley Urban District Council	1904	Harry Mercer	200	Direct ..	75	26	..	£3,100	80 kw.	2 arc, 99 inc.	3=5

[illegible]	[illegible]	4=1½ H.P. ..	..	60.5 KW.	6.7	Lg. 6; pr. lg. 1; pr. 2	scale	2,100	J. D. Mitchell. Data for 1908	
988 KW.	8 Nernst 8 arc, 16 mtl.	49=275 H.P.	50=1,250 H.P.	2,133 KW.	..	Lg. 5, 4½ & 3; pb. lg. £140 p.a.; pr. 2 to 1½; tr. 1½	Max. demand and flat rate	937,652	Lighting and traction. Data to Mar. 31, 1909	102
491 KW.	..	39 KW. (inc. htg.)	..	530 KW.	7.7	Lg. 7 & 4, or 6; pr. 2½	Max. demand & flat rate	130,646	Data to Dec. 31, 1908	103
1,573 KW.	64 arc; inc. & N.=444 8-C.P.s	47=579 H.P.	21=1,100 H.P.	2,940 KW.	..	Lg. 7 & 3, or 6 w. dis.*; pr. 2½; tr. 2½	Max. demand & flat rate w. discount	1,101,070	Lighting and traction. *Pb. lg. arc £80 p.a., or 2½d. p.u., inc. (12 c.p.) £1 12s. p.a. Data to Mar. 31, 1909	104
4,944 KW.	557 arc, 125 mtl.	364=1,670 H.P.	..	6,788 KW.	20	Lg. 5½ to 3; pb. lg. arc £22, inc. £3½ p.a.; pr. 1½	Flat rate with discounts	3,875,675	Data to Dec. 1908	105
985 KW.	56 arc, 222 cbn., 30 mtl.	110=753 H.P.	See other Table	1,687 KW. (ex. tr.)	11	Lg. 6 & 1½, or 4; pb.lg. 2 (arc £20 p.a.); pr. 6 & 1; tr. 2 to 1, av. 1.3	2-rate meter, flat rate, & prept.	2,022,207	Lighting and traction. Data to Mar. 31, 1908	106
62 KW.	35 cbn. ..	3=12 H.P.	..	72 KW. ..	100	Lg. 6; pb. lg. £35; pr. 4 to 1..	Flat rate & sliding scale	19,300	Data to Sept. 30, 1903	107
180.6 KW.	..	60=546 H.P.	16	651 KW. (ex. tr.)	37	Lg. 4½; pr. spl.; htg. 1½; tr. sl. scale	Max. demand, flat rate & sl. scale.	1,074,332	Lighting and traction station. *Resident engineer, W. A. Ritchie. Data for 1908	108
60 KW.	..	24=36.5 H.P.	..	95 KW. ..	60	Lg. 7; pr. 3	Flat rate, with discounts	26,934	Lighting station. Data to Dec. 31, 1908	109
3,221 KW.	86 arc ..	404=1,708 KW.	144=3,580 H.P.	8,549 KW.	24	Lg. 3½ to 2; pb. lg. arc £15, £12, £8 p.a.; pr. 2½ max.; tr. 1½	Flat rate with dis.; spl. m.d. for pr.	4,719,085	Lighting and traction. Data to April 30, 1908	110
..	72 arc, 779 mtl.	49=190 H.P.	..	4,367 KW.	8.4	Lg. 4½ (arc 4), or 7 & 2; pb. lg. arc £18 14s., inc. £2.1.8*; pr. 1½	Flat rate & max. demand	1,487,107	*Osram lamps supplied free for pb. lg. Decrease in units sold due to mtl. lamps. Data to Mar. 31,1909	111
3,213 KW.	96 arc, 7×2 mtl.	111=296 H.P.	..	3,524 KW.	6.5	Lg. 5½, hotels 7 & 4½ (arc 4½); pb. lg. arc £20 3s.p.a.; pr. 2½ to 1	Flat rate, max. demand, & 2-rate mtr.	1,360,899	*Purchased from Company in 1900. †Also double tariff, 5½ night, 2½ day. Data to Mar. 31, 1909	112
1,524 KW.	200 arc, 84 cbn., 25 mtl.	76=224½ H.P.	80=2,000 H.P.	3,519 KW.	5.2	Lg. 5 & 2, or 3½; pb. lg. arc £18; pr. 2 & 1½; tr. 1.5	Max. dem., fla', sl. scale, contract, etc.	2,116,000 (1906)	Lighting and traction. *Including heaters. Data to Mar. 31, 1908	113
188 KW.	24 arc, 408×2 mtl.	5=9 H.P. ..	..	233 KW...	40	Lg. 4½ (slot meters 5); pr. 3 ..	Flat rate, sl. scale & contract	165,000	*R. P. Wilson, Cons. eng. †Bulk supply from Ebbw Vale Steel, Iron & Coal Co. Data to Mar. 31, 1909	114
540 KW.	27 arc, 303 posts	47=196 H.P.	..	795 KW. (ex. tr.)	..	Lg. 7 & 2, or 4; pb. lg. 1⅔; pr. 2½ to 1; tr. 1½ to 1	Max. dem.. flat, sl. sc.,2-rate mtr. & cont.	1,050,034	Lighting and traction. Tramways leased to Salford Corporation. Data to March 31, 1909	115
..	..	..	..	..	..	Lg. 2½ w. dis. to 25%; pb. lg. arc £9, inc. £1 to £2 1s., pr. 1½ to ⅞	Flat rate (with discount for lg. only)	..	.. ..	116
135.5 KW.	36 flame arc	10=93.5 H.P.	..	229 KW.	112	Lg. 6 & 2, or 5; pb. lg. arc £19½ p.a.; pr. 4 & 1; htg. 3 & 1	Max. demand & flat rate	104,097	*C. J. Barnett, resident eng. †Bulk supply. Data to March 31, 1909	117
334 KW.	24 arc, 22 cbn., 56 mtl.	51=229 H.P.	..	525 KW.	17	Lg. 4; pb. lg. 1.8; pr. 2 to 1	Flat rate & sl. scale	174,741	Data to Mar. 31, 1909	118
480 KW.	12 arc, 119 cbn., 300 mtl.	18=40 H.P...	..	515 KW.	..	Lg. 5½ (arc lg. 4); pb. lg. arc £17½ p.a.*; pr. 3½	Flat rate	212,517	*Tantalum, £5; inc., £3½ p.a. Data to Mar. 31, 1903 ..	119
227 KW.	..	137 H.P. ..	..	350 KW.	59	Lg. 7 & 2; pr. 4 & 1 (ex.peak 1½); htg. 2	Max. demand & flat rate	151,827	Bulk supply from North Metropolitan E.P.S. Co. *Eng. in chief, E. T. R. Murray. Data to Mar. 31, 1909	120
913 KW.	19 arc, 511 cbn., 84N.,7×2 mdn.	110=808 H.P.	34=850 H.P.	2,150 KW.	17.39	Lg. 7 & 2, or 4½ (arc, 2½); pb. lg., arc £20, p.a.; pr. 2 to 1½; tr. 1⅝	Max. dem. flat, sl. sc., 2-rate, w. dis., t. sw.	1,258,035	Lg. and tr. *Exc. £12,114 for tramway plant. †Inc. (2 × 8 c.p.) £3.17s., N. £5½ p.a. Data to Mar. 31, 1908	121
1,768 KW.	39 arc, 491 mtl.	106=388 H.P.	40=1,000 H.P.	2,048 KW. (ex. tr.)	9.22	Lg. 4½; pb. lg. contract; pr. 2½ to 1½; tr. 1½	Flat rate and contract	1,875,000 (approx).	Lighting and traction. *By company. Bought by T.C. in 1896. Data to Mar. 31, 1909	122
256 KW.	..	14=47 H.P...	..	303 KW.	25	Lg. 5; pr. 3; htg. 1½	Flat rate with dis.	66,526	*Resident engineer, F. C. Mann. Data for 1908.. ..	123
634 KW.	51 arc, 100 mtl., 10 N.	60=335 H.P.	..	936 KW...	15.6	Lg. 4 to 3; pb. lg. arc £15 p.a.; pr. 2 to 1	Flat rate with dis.	300,600 (estimate)	Data to May 15, 1909	124
173 KW.	..	16=18½ H.P.	..	217 KW...	34	Lg. 5; pr. 3; htg. 1½	Flat rate	76,465	*Res den engineer, E. E. Smeeton. Data for 1908 ..	125
168	27 arc, 111 cbn., 9 mtl.	2=½ H.P. ..	..	186 KW.	..	Lg. 6	Flat rate	97,668	.. ..	126
377 KW.	133 arc, 186 inc.	460 H.P. ..	24=600 H.P.	1,396 KW.	5	Lg 4½ net; pb. lg. arc £16; pr. 2½ to ⅝; tr. 1.5	Flat rate, sl. scale & contract	811,986	Lighting and traction. Supply to Kearsley, and light railway to Pendlebury. Data to Mar. 31, 1908	127
150 KW.	10 arc, 8 cbn., 20 mtl., 100 N.	10=30 H.P...	..	200 KW.	..	Lg. 6 to 4½; pr. 3 to 1½	Sliding scale ..	119,689	Gas power. Data to Mar. 1908	128
300 KW.	40 arc, 10 mtl.	15=22 H.P.	..	350 KW.	..	Lg. 8 & 6½; pb. lg. 3½; pr. 6 to 4; htg. 3	Flat rate & sliding scale	100,000	* Undertaking leased to Co. by Felixstowe & Walton U.D.C.	129
238 KW.	170 arc & inc.	2=5 H.P. ..	700 H.P. ..	917 KW.	..	Lg. 4; pr. 4; tr. 1½ & 1 ..	Flat rate & contract	..	Lighting & traction. Water power	130
1,264 KW.	3,644 inc. (equiv. 8-C.P.)	35=110 H.P.	..	1440 KW.	..	Lg. 6 & 3, or 4⅔; pb. lg. inc. £8 p.a.; pr. 3	Flat rate, max. demand & cont.	700,100	.. ..	131
..	6 inc. ..	1=4 H.P. ..	..	..	60 lps. (16 c.p.)	Lg. 6 to 4; pb. lg. & pr., contract	Flat rate & contract	..	Water power	132
840 KW.	21 arc ..	50=420 H.P.	..	1,228 KW.	..	Lg. 6 to 3; pb. lg. 4 incl.; pr. 3 to 1½; htg. 1½	Sliding scale ..	310,000	*Purchased from Syndicate as from June 30th, 1909. Data to Mar. 31, 1909	133
..	88 arc, 438 cbn. mtl. & N.	..	..	3,466 KW.	8	Lg. 6 w. dis.; pb. lg. arc £14 & £18; pr. 3	Flat rate	1,331,884	Supply to Sandgate and Hythe at 2,750 v. D.C. Data to Dec. 31, 1908	134
50 KW.	..	7=15 H.P. ..	..	217 KW.	10	Lg. 5; pr. 4	Flat rate	10,650	Data for 1908	135
..	..	..	..	..	..	.. ..	.. .. ..	..	*Bulk supply	136
200 KW.	6 arc, 60 inc.	2=4 H.P. ..	..	210 KW.	..	Lg. 6½; pb. lg. contract; pr. 1	Flat rate	..	Water power, also part oil	137
83 KW.	..	4=10 H.P. ..	..	93 KW.	..	Lg. 6; pr. 3 to 2	Flat rate	15,000	Gas power	138
254 KW.	10 arc, 258 N.	185=712 H.P.	..	951 KW...	11.3	Lg. 7 & 3, or 6; pb. lg. 2½; pr. 4 & 1, or 2½	Max. dem., flat, 2-rate and contract	457,661	Data to Dec. 31, 1908	139
179 KW.	20 arc, 148 cbn.	6=15 H.P. ..	..	214 KW...	7.5	Lg. 5; pb. lg. contract; pr. 3 and 2	Flat rate & contract with discounts	197,878	Water power mainly; part gas power. Data to Dec. 31, 1908	140
1,722 KW.	75 cbn., 2 mtl., =6 KW.	12,190 KW.	1,000 KW. bulk &c. 6,967 KW.	21,885 KW.	41	Lg. 3⅔ (less 5%); pr. 1½ with discounts	Flat rate with discounts	..	* Merz & McLellan (cons. engs.) †Bulk supply from Co. of Durham Elec. Supply Co., Ltd. Data to Dec. 31, 1908	141
585 KW.	2 arc, 142 cbn., 364 mtl.	33=90 H.P.	..	679 KW...	– 13†	Lg. 7 & 1⅔, or 4½ (slot meter 5½); pb. lg. 1½; pr. 2 to 1½; htg. 1	Max. dem.,flat rate, sl. scale & cont.	520,947	Bulk D.C. supply to Naval Authorities. *3-ph. pr., 173 & 397 v. †Dec. due to mtl-fil. lps. Data to Mar. 31, 1908	142
4,514 KW.	837 arc ..	3,853=23,748 H.P.	..	52,250 KW.	10.19	Lg. 3½ to 2; pb. lg. arc £12 & £10 p.a.; pr. 1½ to ⅜* (1908-9)	Max. demand, flat rate, cont. & spl.	32,794,807	3 stn.; at 2, part supply to sub-stn. 25— 3-ph. at 6,500 v. *Spl. rates to very large pr. cons. Data to May 31, 1908	143
293 KW.	45 Nernst ..	225 H.P. ..	16=480 H.P.	848 KW...	4.5	Lg. 4½; pr. 2½ & spl.; tr. 1½ ..	Flat rate	518,352	Lighting and traction station. Data to end of 1908 ..	144
1,253 KW.	175 arc, 7 mtl., 3 N.	96=421 H.P.	60=1,500 H.P.	3,152 KW.	5	Lg. 6 & 2, or 4; pb. lg. 2.28; pr. 2 to 1½; htg. 2; tr. 1	Max. dem., flat rate, sl. scale & special	1,390,253	Lighting and traction. Data to Mar. 31, 1909	145
740 KW.	10 arc, 240 inc., 1 N.	26=65 KW.	..	797 KW...	11	Lg. 7 & 4, or 6; pb. lg. cont.; pr. 4 & 1½	Max. demand, flat rate and contract	282,946	Data to Dec. 31, 1908	146
260 KW.	57 inc. ..	1=3 H.P. ..	..	267 KW...	..	Lg. 6 & 4, or 1/3 per c.p. p.a.; pr. 3	Max. demand and contract	4,000	Data for 1907	147
119 KW.	..	3=10 H.P. ..	..	153 KW...	94.6	Lg. 4½; pr. 2, 1½ & 1	Flat rate with dis.	31,820	*Current supplied in bulk by Gosport & Fareham Tramways Station at 1½d. per unit. Data to Dec., 1908	148
1,772 KW.	215 arc ..	4,759 H.P. ..	..	5,890 KW.	18.8	Lg. 6 & 1, or 3½ & 3; pb. lg. arc £14 p.a.; pr. 2 to ⅜	Max. demand, flat rate & sliding scale	2,351,379 (estimated)	Data to May 15, 1909	149
750 KW.	..	310 KW. ..	..	1,030 KW.	4.5	Lg. 7 & 3, or 5; pr. 4 & 1, or 2½, and special	Max. dem., flat, 2-rate & cont.	312,527	Lighting, free wiring, 6d. per lamp per quarter; and hire-purchase over 3, 5 or 7 years. Data to Dec. 31, 1908	150
..	27 arc ..	10=85 H.P.	40=1,200 H.P.	567 KW.	..	Lg. 7 & 2, or 5; pr. 2-rate, 5 & 1, or 2; tr. 2 to 1½*	Max. demand, flat, 2-rate m. & cont.	755,000	Lighting and traction. *Pb. lg. arc £17.5 & £10, Nernst £3.7 p.a.	151
339 KW.	201 inc., 45 N., 19 mtl.	24=72 H.P.	..	427 KW.	..	Lg. 5 to 3; pb. lg. 3; pr. 2½ ..	Sliding scale & flat rate	211,589	.. ..	152
1,565 KW.	24 mtl. 78 N.	15=55 H.P...	..	1,618 KW.	..	Lg. 5, or 9 & 1½; pb. lg. 5, less 33⅓%; pr. 2½	Flat rate & max. demand	354,750	Data to Dec. 31, 1907	153
3,916 KW.*	50 arc, 4 mtl., 2 N.	367=5,180* H.P.	82=2,250 H.P.	9,040 KW.*	17*	Lg. 4 & 1½; pr. 2½ to 1; tr. 1½ to 0.85	Max. demand, flat rate and sl. scale	3,560,000*	Lighting and traction. *Estimated to June 30, 1909 ..	154
1,567 KW.	82 arc, 34 cbn., 43 mtl.	151=1,013 H.P.	Max. dem. = 252 KW.	2,631 KW.* (ex. tr.)	..	Lg. 4; pb. lg. arc £20 p.a.; pr. 2½ to 1½, & 1 (time sw.); tr. 1½ to 1½	Max. dem., flat rate, sl. scale & cont.	2,043,138	Lighting and traction (supply to Tram. Co.). *Also bulk supply to G.C.Ry. Docks & Admlty. Data to Mar. 31,'09	155
838 KW.	16 mtl. ..	1,857 H.P.	..	2,695 KW.	5.5	Lg. 7 & 3, or 6, 5½; pb. lg. inc. £2½ p.a.; pr. 4 & 1½, or 2½, 2; htg. 2	Max. demand & flat rate	1,045,300	Two stations, one gas power. 2,600 v. D.C. to sub-stations. Data to Dec. 31, 1907	156
*	6 mtl. ..	60=346 H.P.	..	*	..	Lg. 7, less 1d. discount; pb. lg. cont.; pr. 3 to 1½	Flat rate, 2-rate mtr. & contract	334,732	Part oil power (Diesel engines). *Number of lamps connected not registered. Data to Dec. 31, 1908	157
1,754 KW.	61 arc, 78 cbn., 4 mtl., 2 N.	421=1,982 H.P.	See other Table.	5,452 KW.	7.9	Lg. 4 to 3; pb. lg. 3; pr. 2 to ⅞; tr. 1½	Flat rate & sliding scale	5,536,311	Lighting and traction (A.C. to sub-stations, 3-ph., 5,500 v., 25—). Data to Mar. 31, 1909	158
480 KW.	66 arc, 8 N.	93=430 H.P.	..	938 KW...	25.9	Lg. 4; pr. 2 & 1	Max. demand & flat rate	338,596	Data to Dec. 31, 1907	159
522 KW.	124 arc, 246 cbn.	85=446 H.P.	240 H.P. ..	1,172 KW.	23.4	Lg. 4; pb. lg. £12 p.a.; pr. & tr. 2 & 1½	Flat rate with dis.	731,465	Lighting and traction. Data to Dec. 31, 1908	160
2,153 KW.	71 arc, 459 cbn.	129=876 H.P.	..	2,939 KW.	10.3	Lg. 6, 4½, 3, 2 & 1; pb. lg. average 1.8 inclusive; pr. 3, 1, ⅜ & ⅓	Max. dem., 2-rate, cont. & time sw.	1,616,624	Small auxiliary plant at destructor works. Data approx. to May 1909, otherwise to Mar. 31, 1909	161
3,643 KW.	81 arc, 203 cbn., 257 mtl.	110=348 H.P.	..	3,044 KW.	4.2	Lg. 6, 2 & 1½, or 5; pb. lg. 1½; pr. & htg. 2 & 1½	Max. demand, flat ra e & contract	1,153,623	Reduction on total units sold, owing to metallic filament lamps. Data to March 31, 1909	162
1,153 KW. (c. motors)	..	..	..	1,153 KW.	5	Lg. inc. 7 & 4½, arc 7 & 1; pr. 4 & 1½; ch. 6	Max. demand ..	400,402	Data to Dec. 31, 1908	163
150 KW.	..	687 KW.	..	837 KW.	..	Lg. 4½; pr. 2 to 1½	Flat rate & sliding scale	..	*Used as stand-by; bulk supply (850 KW.) fm. C. of D. Co. Con. engrs. Merz & McLellan. Data to Dec. 31, 1908	164
1,313 KW.	113 arc, 107 cbn., 2 m l.	21=65 H.P.	..	1,442 KW.	..	Lg. 6, or 6 & 2½ (spl.); pb. lg. arc £20, inc. £3½ p.a.; pr. 3	Flat rate & special	821,671	Data to Mar. 31, 1908	165
1,529 KW.	12 arc, 3 cbn., 433×2 mtl.	660 KW. ..	..	1,212 KW.	2	Lg. 5 & 3, or 4 (mills); pb. lg. about 1.25; pr. 2½ to 0.9	Max. dem., flat rate, sl. scale & cont.	862,022	Data to Dec. 31, 1908	166
474 KW.	..	3,263 KW.	..	3,737 KW.	..	Lg. 3⅔; pr. 1⅓ with discounts ..	Flat rate with dis.	..	*Also bulk supply fm. C. of D. Co. Cons. Engrs. Merz & McLellan; Man. C. W. Fairweather. Data to Dec. 31,'08	167
150 KW.	36 mtl. ..	17=60 H.P...	..	167 KW. ..	12	Lg. 5; pb. lg. 3; pr. 2	Flat rate with discount	67,000	Data to Mar. 31, 1908	168
410 KW.	10 arc, 147 cbn., 47 mtl.	95=782 H.P.	400 KW. ..	1,504 KW.	6.5	Lg. 4; pb. lg. 1½; pr. 1; tr. 2 ..	Flat rate, sl. scale w. dis. & special	660,876	Lighting and traction. Data to Mar. 31, 1909	169
..	..	..	..	402 KW. ..	..	Lg. 5; pr. 3; htg. 1½	Flat rate	80,709	Data to Dec. 31, 1908	170
633 KW.	4 arc ..	90=340 H.P.	..	1,000 KW.	12.5	Lg. 4½; pr. 3 to 1, with dis.	Flat rate, 2-rate, & sl. scale with dis.	330,000 (estimated)	Data to Mar. 25, 1909	171
338 KW.	9 arc, with 18 inc.	8=41½ H.P.	..	379 KW...	9.25	Lg. 7 & 2 (max. 5); pb. lg. arc £14½ p.a.; pr. 4½ & 1½	Max. demand and flat rate	171,793	*E. T. R. Murray, engineer-in-chief. † Bulk supply from North Met. El. Power Supply Co. Data to Mar. 31, '09	172
792 KW.	51 arc, 288 mtl.	45=304½ H.P.	..	1,089 KW.	20	Lg. 5 w. dis. to 20%; pb. lg. 2.46; pr. 2, 1½, 1½	Flat rate with discounts	557,485	Station run in conjunction with 6-cell destructor. Data to Dec. 31, 1908	173
52 KW.	..	9=48½ H.P...	..	91 KW. ..	..	Lg. 5; pr. 2	Flat rate with discounts	46,599	Lg. & tr. Consumers doubled wt. inc. demand; due to mtl.-fil. lps. Data to Dec. 31, 1907	174
31.4 KW.	4 arc ..	66=223 H.P.	16=400 H.P.	416.5 KW.	12	Lg. 6 & 3, or 4½; pb. lg. contract; pr. 2½ and 1½; tr. 1.5	Flat rate, sl. scale, cont. & special	612,071	Lighting and traction. Data to Mar. 31, 1909	175
351 KW.	18 arc, 109 mtl., 169 inc.	36=158 H.P.	..	514 KW...	6.35	Lg. 7 & 3, or 5; pb. lg. arc £16½, inc. £3 p.a.; pr. 4½ & 1½, & spl.	Max. dem., flat rate, and cont. w. dis.	392,378	Bulk supply from North Metropolitan E. P. S. Co. *E. T. R. Murray, engineer-in-chief. Data to Mar. 31,1909	176
1,007 KW.	19 arc, 20 mtl., 350 N.	155=568 H.P.	..	1,654 KW.	3.5	Lg. 5 & 3; pb. lg. arc £13, N. £3; pr. 4 & 1, or 2½	Max. dem., flat rate 2-rate, cont. & spl.	768,609	Data to Dec. 31, 1908	177
150 KW.	..	7=23 H.P. ..	..	170 KW...	..	Lg. 8; pr. 4	Flat rate	92,678	Part oil power. Data to Dec. 31, 1908	178
188 KW.	..	7=18 H.P. ..	..	207 KW...	50	Lg. 5; pr. 3; htg. 1½	Flat rate	43,764	*Resident engineer, Geo. T. Laverty. Data for 1908 ..	179
312 KW.	9 arc, 462 cbn.	8=5½ H.P. ..	..	258 KW...	23	Lg. 5; pb. lg. 3; pr. 3	Flat rate	125,287	Data to Mar. 31, 1908	180
50 KW.	2 arc, 99 inc.	3=5 H.P.	..	65 KW.	..	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

164	HARTLEPOOL	Cleveland & Durham County Elec. Pr. Supply Co., Ltd.	1904	A. B. Gridley (Mgr.) T. Mitchell (Res.)	230 & 460	Direct	400*	410			(inc. motors) 150 KW.		
165	HASTINGS	Hastings Corporation	1882	R. F. Ferguson	200 & 400	100~, 1-ph.	1,850	615	80 KW.	£165,240	1,313 KW.	118 arc, 107 cbn., 2 m l.	
166	HAWICK	Urban Electric Supply Co., Ltd.	1901	A. N. Rye	240 & 480	Direct	600	496	50 KW.	£65,432	529 KW.	12 arc, 3 cbn., 433×2 mtl.	
167	HEBBURN & FELLING	Northern Counties Elec. Spy. Co., Ltd. (Owned by U.D.C.)	1908	W. Bates and W. R. Rogers	230 & 460 D.C. 440 A.C.	Direct & A.C.	3,400*	2,428			474 KW.		
168	HEBDEN BRIDGE	Hebden Bridge Urban District Council	1904	J. W. Garside	240 & 480	Direct	215	120	500 A.H.	£11,500	150 KW.	36 mtl.	
169	HECKMONDWIKE	Heckmondwike Urban District Council	1901	Geo. H. Carter	230 & 460 tr. 550	Direct	1,000	716	138 KW.	£40,548	410 KW.	10 arc, 147 cbn., 47 mtl.	
170	HENDON	Hendon Electric Supply Co., Ltd.	1907	B. G. Drummond	240 & 415	50~, 3-ph.	Bulk sply.	124		£32,000			
171	HEREFORD	Hereford Corporation	1899	W. T. Kerr	220 & 440	Direct	810	345	50 KW.	£42,000	633 KW.	4 arc	
172	HERTFORD	North Metropolitan Elec. Pr. Distribution Co., Ltd.	1901	J. M. Bowman (Res.)*	230 & 460	Direct	300†	153	40 KW.	£11,000	338 KW.	9 arc, with 18 inc.	
173	HESTON & ISLEWORTH	Heston and Isleworth Urban District Council	1904	Percy E. Rycroft	240 & 480	Direct	500	386	200 KW.	£57,399	792 KW.	51 arc, 288 mtl.	
174	HEXHAM	Hexham and District Electric Supply Co., Ltd.	1906	Wilfred Hall (Cons. Eng.)	120 lg., 220 & 440 pr.	40~, 3-ph.	100	36		£8,484	52 KW.		
175	HEYWOOD	Heywood Corporation	1900	Jas. Stott	200 & 400 tr. 500	Direct	900	98	100 KW.	£26,936	231.4 KW.	4 arc	
176	HICH BARNET	North Metropolitan Elec Pr. Distribution Co., Ltd.	1900	H. Bernard Sale (Res.)*	230 & 460	Direct	500	312		£14,444	351 KW.	18 arc, 169 mtl., 169 inc.	
177	HICH WYCOMBE	Wycombe (Borough) Electric Light & Power Co., Ltd.	1898	W. E. Brandreth	210 & 420	Direct	880	530	110 KW.	£100,284	1,007 KW.	12 arc, 20 mtl., 350 N.	
178	HINDHEAD AND DIST.	Hindhead & District Electric Light Co., Ltd.	1900	T. B. Reader	220 & 440	Direct	175	70	27 KW.	£19,956	150 KW.		
179	HITCHIN	Electric Supply Corporation, Ltd.	1906	K. A. Scott-Moncrieff*	240 & 480	Direct	200	61.2	77 KW.	£18,950	183 KW.		
180	HOLYHEAD	Holyhead Urban District Council	1904	P. Williams	200 & 400	Direct	220	149	240 KW.	£21,405	212 KW.	9 arc, 452 cbn.	
181	HONLEY	Honley Urban District Council	1904	Harry Marsden (Gen. Man.)	200	Direct	75	26		£3,100	80 KW.	2 arc, 99 inc.	
182	HORNSEY	Hornsey Corporation	1908	N. Staniland	240 & 480	Direct	1,300	665	250 KW.	£137,866	2,393 KW.	58 arc, 126 inc.	
183	HORSHAM	Horsham Urban District Council	1902	J. B. Morgan	230 & 460	Direct	400	178	115 KW.	£28,320	470 KW.	21 arc, 30 cbn., 250 mtl.	
184	HOUGHTON-LE-SPRING	Houghton-le-Spring & Dist. Electric Lighting Co., Ltd.	1907		220	40~, 3-ph.	Bulk supply*				96 KW.	24 mtl.	
185	HOVE (ALDRINGTON)	Hove Corporation	1905	H. H. Scott (Boro' Surveyor)	230 & 440	Direct		22		£9,029	138 KW.	4 mtl.	
186	HOVE	Hove Electric Lighting Co., Ltd.	1892	C. B. Smith	220	Direct	1,008	901	36 KW.	£165,483	3,262 KW.		
187	HOYLAKE & W. KIRBY	Hoylake & W. Kirby Urban District Council	1901	C. J. Turner	230	50~, 1-ph.	625	330	300 A.H.	£52,019	1,341 KW.	3 arc, 429 cbn., 50 mtl., 8 N.	
188	HUDDERSFIELD	Huddersfield Corporation	1893	A. B. Mountain	100, 200, & 400*	100~, 1 ph. 50~, 3-ph.	1-ph. 2,650 3-ph. 5,750	2,412		£203,239	5,018 KW.	99 arc, 48 inc. 4 N.	
189	HULL	Hull Corporation	1893	H. Bell	230 & 440	Direct	6,454	4,724	433 KW.-hrs.	£354,977	6,097 KW.	90 arc, 42 Nernst	
190	ILFORD	Ilford Urban District Council	1901	A. H. Shaw	230 & 460 tr. 500	Direct	8,600	1,675	200 KW.	£170,111	2,629 KW.	106 arc, 1,000 cbn., 540 mtl.	
191	ILFRACOMBE	Ilfracombe Electric Light & Power Co., Ltd.	1908	A. A. Jenkins	240 & 480	Direct	330	169	8½ KW.	£33,484	425 KW.		
192	ILKESTON	Ilkeston Corporation	1903	A. C. Gilbert	230 & 460 tr. 500	Direct	*			£16,598	1,320 KW.	20 arc, 200 inc.	
193	INGLETON (YORKS)	Ingleton Electric Lighting & Power Co., Ltd.	1900	D. Tattersall	100 & 200	Direct	29	22	12½ KW.	£6,000	68 KW.	36 inc.	
194	INVERNESS	North of Scotland Electric Light & Power Co., Ltd.	1905	E. J. Williams	240 & 480	Direct	330	188	100 KW.	£30,451	254 KW.		
195	IPSWICH	Ipswich Corporation	1903	F. Ayton	230 & 460	Direct	1,511	837	210 KW.	£87,015	1,298 KW.	2 mtl.	
196	JEDBURGH	Electric Supply Corporation Ltd.	1908	K. A. Scott-Moncrieff*	225 & 450	Direct	66	34	35 KW.	£12,950	83 KW.	9 arc, 12 cbn., 102 Nernst	
197	KEIGHLEY	Keighley Corporation	1901	J. M. Smyth	230 & 460, tr. 500	Direct	740	330	100 KW.	£57,409	333 KW.	18 arc, 24 cbn., 48 N.	
198	KENDAL	Kendal Corporation	1902	John A. T. Barnes	220 & 440	Direct	109.5	67	40 KW.	£14,189	160 KW.		
199	KESWICK	Keswick Electric Light Co., Ltd.	1890	W. Jackson	100	75~, 1-ph.	120	60		£13,761		3 arc, 20 inc.	
200	KETTERING	Kettering Urban District Council	1904	W. A. Walker	230 & 460	Direct	775	455	70 KW.	£52,902	651 KW.	30 arc, 60 cbn.*, 19 mtl*, 203 N.*	
201	KEYNSHAM & KINGSWOOD	Keynsham Electric Light & Power Co., Ltd.	1891	G. J. T. J. Parfitt	230	Direct	75	55	50 KW.	£4,350	119 KW.	6 Nernst, 119 inc.	
202	KIDDERMINSTER	Kidderminster & District Elec. Ltg. & Traction Co., Ltd.	1900	A. Charlton	230 & 460	Direct	1,550	575	230 KW.	£45,774	655 KW.		
203	KILDARE	Naas Rural District Council	1905	H. Rylance	200	Direct	32			£3,800			
204	KILLARNEY	Kerry Electric Supply Co., Ltd.	1893	Valentine Ryan	100	100~, 1-ph.	160	52		£7,000	133 KW.		
205	KILMACOLM	Kilmalcolm Electric Lighting Co., Ltd.	1908	James Brown	240 & 480	Direct	50	46	20 KW.	£10,000	316 KW.	6 cbn., 6 mtl.	
206	KILMARNOCK	Kilmarnock Corporation	1904	A. H. Burbidge	240 & 480	Direct	755	547	60 KW.	£43,556	583 KW.	50 arc	
207	KING'S LYNN	King's Lynn Corporation	1899	J. Pilling	200 & 400	Direct	680	332	60 KW.	£49,866	755 KW.	232 cbn., 238 mtl., 15 N.	
208	KINGSTON-UPON-THAMES	Kingston-upon-Thames Corporation	1893	J. E. Edgcome	105	77~, 1-ph.	860	574		£99,651	1,303 KW.	76 arc*, 200 cbn., 35 mtl.	
209	KIRKCALDY	Kirkcaldy Corporation	1902	O. F. Francis	230 & 460, tr. 500	Direct	1,090	811		£64,707	759 KW.	104 arc, 212 cbn.	
210	LANCASTER	Lancaster Corporation	1893	W. A. Tester	230 & 460, tr. 525	Direct	1,250	700		£63,800	1,770 KW.	41 arc, 84 mtl.	
211	LARNE	Larne Electric Light Works, Ltd.	1891	M. G. Smyth	105 & 210	100~, 1-ph.	150	72			78 KW.	14 arc, 136 inc.	
212	LEAMINGTON	Midland Electric Light & Power Co., Ltd.	1887	Percy Older	115 & 230	Direct	524	238	107 KW.		754 KW.	1 arc	
213	LEATHERHEAD ASHTEAD & MICKLEHAM	Leatherhead & District Electricity Co., Ltd.	1902	H. Leslie Dixon	220 & 440	Direct	150	91.3	80 KW. (600 A.H.)	£33,450	363 KW.		
214	LEEDS	Leeds Corporation	1893	H. Dickinson	100, 200 & 400	50~, 1-ph. & 2-ph.	15,740	8,220		£916,914	10,611 KW.	686 arc	
215	LEEK	Leek Urban District Council	1904	R. M. Carr	230 & 460	Direct	430	177	64.4 KW.	£15,747	233 KW.		
216	LEICESTER	Leicester Corporation	1894	A. Colson	100 & 200	50~, 1 ph.	4,400	1,980		£338,818	7,090 KW.		
217	LEIGH	Leigh Corporation	1899	Arthur T. Smith	220 & 440	Direct	760	440	132 KW.	£45,748	679 KW.		
218	LEITH	Leith Corporation	1899	A. P. Rutherford	230 & 460 tr. 500	Direct	2,830	1,891	75 KW.	£147,558	2,501 KW.*	299 arc	
219	LETCHWORTH	First Garden City Co., Ltd.	1907	Charles Gould	250 & 500	Direct	130	90	40 KW.		10 KW.		
220	LEWES	Lewes & District Electric Supply Co. Ltd.	1901	C. F. Butler	230 & 460	Direct	330	140	20 KW.	£25,044	371 KW.		
221	LEYTON	Leyton Urban District Council	1896	F. Harman Lewis	150 & 300 tr. 500	Direct	3,140	1,030 lg. 910 tr.	64 KW.	£179,233	2,080 KW.	82 arc, 819 cbn., 637 mtl.	
222	LIMAVADY	Limavady Power & Light Works	1897	E. J. S. Ritter	110 & 220	100~, 1-ph.	240	85			93 KW.		
223	LIMERICK	Limerick Corporation	1902	P. T. MacNamara	230 & 460	Direct	360	250	93 KW.	£30,030		64 arc	
224	LINCOLN	Lincoln Corporation	1898	Stanley Clegg	230 & 460 tr. 500	Direct	1,894	844 lg. 185 tr.	34.5 KW.	£65,151	1,214 KW.	34 arc, 22 cbn., 70 mtl., 3 N.	
225	LIVERPOOL	Liverpool Corporation	1883	A. Clough (Res.) A. B. Holmes (Con.)	230 & 460, tr. 500	Direct	35,300	17,245		£2,050,108	21,312 KW.	193 arc, 498 cbn.	

~=cycles per second; lg. = lighting; pb. lg. = public lighting; pr. = power htg. = heating; in. c. = incandescent; cbn. = carbon; mtl. = metal filament; N. = Nernst; A. = amperes; A.H.

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A 1 ACCUMULATOR ACID.

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150 KW.	..	687 KW.	..	687 KW.	..	& 1½; ch. 6 Lg. 4½; pr. 2 to 1½	Flat rate & sliding scale	..	*Used as stand-by; bulk supply (350 KW.) fm. C. of D. Co. Con. engrs. Merz & McLellan. Data to Dec. 31, 1908	164
1,313 KW.	118 arc, 107 cbn., 2 m l.	21=65 H.P.	..	1,442 KW.	..	Lg. 6, or 6 & 2½ (spl.); pb. lg. arc £20, inc. £3½ p.a.; pr. 3	Flat rate & special	891,671	Data to Mar. 31, 1908	165
529 KW.	12 arc, 3 cbn., 433×2 mtl.	660 KW. ..	..	1,312 KW.	2	Lg. 5 & 3, or 4 (mills); pb. lg. about 1.25; pr. 2½ to 0.9	Max. dem., flat rate, sl. scale & cont.	869,023	Data to Dec. 31, 1908	166
474 KW.	..	3,263 KW.	..	3,737 KW.	..	Lg. 3½; pr. 1½ with discounts ..	Flat rate with dis.	..	*Also bulk supply fm. C. of D. Co. Cons. Engrs. Merz & McLellan; Man. C. W. Fairweather. Data to Dec. 31, '08	167
150 KW.	86 mtl. ..	17=60 H.P...	.. ..	167 KW. ..	12	Lg. 5; pb. lg. 3; pr. 2	Flat rate with discount	67,000	Data to Mar. 31, 1908	168
410 KW.	10 arc, 147 cbn., 47 mtl.	95=782 H.P.	400 KW. ..	1,504 KW.	6.5	Lg. 4; pb. lg. 1½; pr. 1; tr. 2 ..	Flat rate, sl. scale w. dis. & special	660,876	Lighting and traction. Data to Mar. 31, 1909	169
..	..	..	..	402 KW. ..	..	Lg. 5; pr. 3; htg. 1½	Flat rate	80,709	Data to Dec. 31, 1903	170
633 KW.	4 arc ..	90=340 H.P.	..	1,000 KW.	12.5	Lg. 4½; pr. 3 to 1, with dis.	Flat rate, 2-rate, & sl. scale with dis.	330,000 (estimated)	Data to Mar. 25, 1909	171
338 KW.	9 arc, with 18 inc.	8=41½ H.P.	..	379 KW. ..	9.25	Lg. 7 & 2 (max. 5); pb. lg. arc £14½ p.a.; pr. 4½ & 1½	Max. demand and flat rate	171,796	*E. T. R. Murray, engineer-in-chief. †Bulk supply from North Met. El. Power Supply Co. Data to Mar. 31, '09	172
792 KW.	51 arc, 288 mtl.	45=304½ H.P.	..	1,069 KW.	20	Lg. 5 w. dis. to 20%; pb. lg. 2.46; pr. 2, 1½, 1¼	Flat rate with discounts	557,485	Station run in conjunction with 6-cell destructor. Data to Dec. 31, 1908	173
53 KW.	..	9=43½ H.P...	..	91 KW. ..	..	Lg. 5; pr. 2	Flat rate with discounts	46,589	Lg. & tr. Consumers doubled wt. inc. demand; due to mtl.-fil. lps. Data to Dec. 31, 1907	174
231.4 KW.	4 arc ..	66=232 H.P.	16=400 H.P.	416.5 KW.	12	Lg. 6 & 3, or 4½; pb. lg. contract; pr. 2½ and 1½; tr. 1.3	Flat rate, sl. scale, cont. & special	612,071	Lighting and traction. Data to Mar. 31, 1909	175
351 KW.	18 arc, 169 mtl., 169 inc.	36=158 H.P.	..	514 KW. ..	6.25	Lg. 7 & 2, or 5; pb. lg. arc £16⅔, inc. £3 p.a.; pr. 4½ & 1½, & spl.	Max. dem., flat rate, and cont. w. dis.	392,378	Bulk supply from North Metropolitan E. P. S. Co. *E. T. R. Murray, engineer-in-chief. Data to Mar. 31,1909	176
1,007 KW.	12 arc, 20 mtl., 350 N.	155=583 H.P.	..	1,654 KW.	3.5	Lg. 5 & 2; pb. lg. arc £13, N. £3; pr. 4 & 1, or 2½	Max. dem., flat rate 2-rate, cont. & spl.	768,609	Data to Dec. 31, 1908	177
150 KW.	..	7=22 H.P. ..	..	170 KW. ..	..	Lg. 8; pr. 4	Flat rate	92,678	Part oil power. Data to Dec. 31, 1908	178
183 KW.	..	7=18 H.P. ..	..	207 KW. ..	50	Lg. 5; pr. 3; htg. 1½	Flat rate	43,764	*Resident engineer, Geo. T. Laverty. Data for 1908 ..	179
212 KW.	9 arc, 452 cbn.	8=5½ H.P. ..	..	253 KW. ..	23	Lg. 5; pb. lg. 3; pr. 3	Flat rate	125,287	Data to Mar. 31, 1908	180
80 KW.	2 arc, 99 inc.	3=6 H.P. ..	..	87 KW.	..	Lg. 4½ (less 8⅓%); pb. lg. 3; pr. 2½	Flat rate with discount	27,114	.. ..	181
2,393 KW.	58 arc, 126 inc.	22=23½ KW.	..	2,831 KW.	35	Lg. 7 & 2, or 5 to 3; pb. lg. 3; pr. 3½ & 1, or 2	Max. demand and flat rate w. rebates	794,212	Data to Mar. 1908	182
470 KW.	21 arc, 30 cbn., 250 mtl.	14=30 H.P.	..	492 KW. ..	16	Lg. 7 & 3, or 6; pb. lg. 4; pr. 3 & 1½	Max. demand and flat rate	190,000 approx.	Data to Mar. 31, 1908	183
93 KW.	24 mtl. ..	2,220 KW. (inc. collieries)	..	2,316 KW.	..	Lg. 4; pb. lg. £1 7s. per lamp per season; pr. 2 less dis.	Flat rate with discounts	..	*Bulk spl. from Durham Col. Elec. Pr. Co., Ltd. Dist. by Newcastle-on-T. Elec. Spl. Co., Ltd. Data toDec.31, '08	184
138 KW.	4 mtl. ..	6=12 H.P. ..	..	148 KW ..	16.5	Lg. 7 & 4, or 5; pb. lg. 1.4; pr. 5 & 2, or 3½ (2, time-switch).	Max. demand, flat rate & time switch	27,483	*Bulk supply from Brighton Corporation. Data to Mar. 31, 1909	185
3,262 KW.	..	115=382 KW. Rad.=180 KW	..	3,804 KW.	9.4	Lg. 5½, or 7 & 4; pr. 3 & 1½ ..	Flat rate and max. demand	1,134,994	Data to Dec. 31, 1908	186
1,341 KW.	3 arc, 429 cbn., 50 mtl., 8 N.	10=30 H.P.	..	1,691 KW.	12	Lg. 7 & 3, or 5½; pb. lg. 3½; pr. 3 & 1½, or 2	Max. dem., flat, sl. scale, 2-rate & t.s.	401,602	.. ..	187
5,018 KW.	39 arc, 48 inc. 4 N.	391=2,305 H.P.	..	7,324 KW.	12	Lg. 4; pb. lg. arc £17½, inc. 33s. p.a., pr. 2 & 1 (3-ph., 1 w. dis.)	Flat rate w. dis., sl. scale, cont. & spl.	2,462,046	*100 and 200 volts, 1-ph.; 400 volts, 3-ph. Data to Dec. 31, 1908	188
6,097 KW.	90 arc, 42 Nernst	5,543 H.P.	..	10,250 KW.	6	Lg. 5 & 1½, or 4; pb. lg. arc £22, N. £6; pr. 2 to 1	Max. dem., flat, sl. sc. w. dis., cont., t. sw.	5,303,726	Data to Mar. 31, 1908	189
2,622 KW.	106 arc, 1,000 cbn., 540 mtl.	99=605 H.P.	44=1,100 H.P.	4,393 KW.	8	Lg. 6 & 1, or 3½; pb. lg. arc £18 & £9* p.a.; pr. 3 to 1, or 2 & 1; tr. 1.125	Max. demand, flat rate, & sl. scale	3,235,076	Lighting and traction. *Incandescent, £3½ p.a.; 32 C.P. cbn. or 50 C.P. mtl. Data to Mar. 31, 1909	190
425 KW.	..	43=103 H.P.	..	527 KW.	7	Lg. 7 & 3, or 6; pr. 4 & 1½, or 3½	Max. demand and flat rate	132,427	Data to Dec. 31, 1907	191
1,320 KW.	20 arc, 200 inc.	..	26=650 H.P.	1,355 KW.	3	Lg. 3; pb. lg. 3; pr. 2 to 1½; tr. 1	Flat rate	603,094	*Supply in bulk from Derby & Notts Electric Power Co. Data to Mar. 31, 1908	192
68 KW.	36 inc. ..	8=26 H.P. ..	..	85 KW. ..	..	Lg. 6; pb. lg. 2.9; pr. 3 to 1 ..	Flat rate and contract; pr. sl. scale	19,000	Water power. Data to April 20, 1909	193
264 KW.	..	49=218 H.P.	..	489 KW. ..	92	Lg. 7 & 3, or 6; pr. 4 & 1½, or 2½	Max. demand and flat rate	144,069	Data to Dec. 31, 1907	194
1,298 KW.	2 mtl. ..	254=862 H.P.	72=1,800 H.P.	3,960 KW.	16	Lg. 4 less 5% cash; pb. lg. 1; pr. 2 to 1½; tr. 1½	Flat rate	1,399,990	Lighting and traction. Data to Mar. 31, 1909	195
83 KW.	9 arc, 12 cbn., 102 Nernst	7=24 H.P.	..	111.6 KW.	2.8	Lg. 6; pb. lg. 3; pr. 3; htg. 1½	Flat rate	84,464	*Resident engineer, J. H. Dennison. Data for 1908 ..	196
333 KW.	18 arc, 24 cbn., 48 N.	103=490 H.P.	24=720 H.P.	1,366 KW.	6.8	Lg. 7 & 2, or 4½ to 4; pb. lg. 1.78; pr. 2 to 1; tr. 1.75	Max. dem., flat, sl. scale & cont. w. dis.	522,433	Lighting and traction. Data to June 30, 1907 ..	197
160 KW.	..	26=97 H.P.	..	244 KW.	..	Lg. 6; pr. 2½ to 1½	Flat rate	50,529	Part gas power. Data to Mar. 31, 1909	198
..	8 arc, 20 inc.	..	..	237 KW.	..	Lg. 6; pb. lg. contract; pr. 3 ..	Flat rate	53,568	Part water power.	199
651 KW.	30 arc, 60 cbn.*, 19 mtl*, 208 N.*	142=385 H.P.	..	1,261 KW.	33.7	Lg. 4½ (arc 3); pb. lg. arc £17†; pr. 2 to 1	Flat rate & sliding scale	555,282	*Number of posts fitted. †Inc. £5 5s. all night; £3 3s. half-night. Data to Mar. 31, 1909	200
119 KW.	6 Nernst, 119 inc.	6=26 H.P.	..	151.5 KW.	..	Lg. 6; pb. lg. £226 p.a.; pr. 3 to 2½	Flat rate with discount	58,400	.. ..	201
635 KW.	..	41=919 H.P.	26=680 H.P.	2,319 KW.	10.8	Lg. 7 & 2½ (ave. max. 4½) w. discount; pr. 4½ & 1½	Max. demand w. dis., & 2-rate mr.	1,012,194	Lighting and traction. Data to Dec. 31, 1907	202
..	..	..	..	230 KW.	..	Lg. 5; pr. 2½	Flat rate	..	.. ..	203
183 KW.	..	..	..	150 KW. ..	..	6d. with discounts	Flat rate	..	Part water power	204
315 KW.	6 cbn., 6 mtl.	5=7 H.P. ..	..	315 KW. ..	10	Lg. 6; pb. lg. £1 p.a.; pr. 4 ..	Flat rate	57,000	Data to Dec. 31, 1908. Residential district	205
583 KW.	50 arc ..	47=238 H.P.	28=730 H.P.	757 KW. ..	40	Lg. 4½ w. dis.; pb. lg. £880; pr. 2 w. dis.; tr. 1½	Sliding scale and flat rate	675,000	Lighting and traction. Data to May 15, 1908	206
755 KW.	232 cbn., 238 mtl., 15 N.	76=301 H.P.	..	1,032 KW.	3.3	Lg. 4½ to 4½; pb. lg. 1.78; pr. 3 to 1; htg. 1½	Flat rate and max. demand* & spl.	528,563	Part gas power. *Pr. max. demand; flat rate in day-time. Data to Mar. 31, 1909	207
1,303 KW.	76 arc*, 200 cbn., 35 mtl.	53=219 H.P.	..	1,500 KW.	..	Lg. 5, or 7 & 3; pb. lg. arc £20, 32-C.P. inc. £3½ p.a.; pr. 1½	Max. demand and flat rate	692,462	*Two 32-C.P. inc. used after midnight. Data to May 7, 1908	208
759 KW.	104 arc, 212 cbn.	786 H.P. ..	44=1,232 H.P.	2,264 KW.	24	Lg. 4½ to 3; pb. lg. arc £12 p.a.; pr. 1½ to ¾; tr. 1½	Sliding scale ..	1,381,108	Lighting and traction. Data to May 15, 1908	209
1,770 KW.	41 arc, 84 mtl.	104=440 H.P.	24=640 H.P.	2,300 KW.	10.27	Lg. 4½ (5% dis.); pb. lg. 1½ incl.; pr. 2½ & 1½ w. dis. to 20%; tr. 1.7	Flat, sl. scale, 2-rate & contract, w. dis.	765,450*	Lighting and traction. *Increase only 0.47%, due to bad trade and met.-fil. lamps. Data to Mar. 27, 1909	210
78 KW.	14 arc, 136 inc.	..	..	100 KW. ..	..	Lg. 8 to 1½; pb. lg. 2½ inclusive	Flat rate, contract and special	..	Data for 1908-9	211
754 KW.	1 arc ..	40=69 H.P.	..	816 KW...	9.8	Lg. 7 & 2½, or 5½*; pr. 2½ or £5 p. H.P. p.a. & 1½ p.u.	Max. demand, flat rate & time switch*	255,575	*Time switch and 2-rate meter, 6d. and 2½d. Data to Dec. 31, 1908	212
363 KW.	..	12=37 H.P.	..	400 KW...	15.8	Lg. 6½ to 5; pr. 3 to 2½, or £12½ per KW. p.a. & 2d. p.u.	Flat rate, sl. scale, & 2-rate meter.	123,278	Diesel oil engines. Data to Dec. 31, 1908	213
10,611 KW.	686 arc ..	1,710=9,941 H.P.	..	19,676 KW.	6.6	Lg. 4 & 1; pb. lg. 1½; pr. 1½ to 0.8 (less 5%)	Special scale* and max. demand	13,395,118	*Lg., 4d. first 1,000 hrs. use of lamps, 1d. after; pr. max. demand. Data to Mar. 31, 1909	214
232 KW.	..	44=262 H.P.	..	500 KW...	17	Lg. 7 & 2, or 6 to 3½; pr. 2 to 1	Max. dem., flat, sl. scale, time sw., spl.	315,500	Producer gas power (pressure type), using bituminous fuel. Data to Mar. 31, 1909	215
7,020 KW.	..	303=1,047 H.P.	..	7,801 KW.	..	Lg. 4; pr. 2, or £3 per H.P. p.a. & ⅔ p.u.	Flat rate	2,056,141	Max. load reduced owing to general use of metallic-filament lamps. Data to Dec. 31, 1908	216
679 KW.	..	165=1,026 H.P	..	1,444 KW.	..	Lg. 7 & 2, or 4½; pr. 3 & ⅞ (+10% March quarter)	Max. demand & flat rate	769,112	.. ..	217
2,501 KW.*	299 arc ..	415=3,228 H.P.	72=2,160 H.P.	7,606 KW.	10	Lg. 3; pb. lg. arc £14, £10½; pr. 1½; tr. 1	Flat rate, with discount to 25%	2,980,897 May 15 '08	Lighting & traction. *Also 75 radiators=148 KW. Data to April 30, 1909	218
10 KW.	..	25=90 KW.	..	100 KW.	300	Lg. 8 & 1½; pr. 1½	Max demand, flat rate, & special*	50,000	*30% of output supplied to the Co. for pumping, at ¾d. per unit	219
371 KW.	..	16=65 H.P.	..	411 KW...	11.3	Lg. 7 & 2½, or 5; pr. 4½ & 1½, or 2½	Max. demand & flat rate	122,758	Data to Dec. 31, 1908	220
2,080 KW.	82 arc, 819 cbn., 687 mtl.	85=332 H.P.	120=3,600 H.P.	5,700 KW.	5.9	Lg. 5 & 2, or 4*; pr. 3 & 1, or 1½; tr. 1½	Max. demand & flat rate	3,533,398	Lighting and traction. *Pb. lg. arc £21, inc. £4.3.6 (two 40-C.P.) per annum. Data to Mar. 31, 1909	221
33 KW.	..	..	..	33 KW. ..	..	10s. per 8-C.P.	Contract	..	Water power	222
..	64 arc ..	..	..	400 KW...	..	Lg. 5; pr. 3 & 1½..	Flat rate with discounts	260,000	Producer gas power. Data to Dec. 31, 1908	223
1,214 KW.	84 arc, 22 cbn., 70 mtl., 3 N.	163=1,180 H.P.	16=420 H.P.	2,376 KW.	5.9	Lg. 5 & 2½, or 4½ (ch. 4); pb. lg. 5 & 2½ net; pr. 2 & 1, or 2½, 2; tr. 1½	Max. dem., flat w. dis., sl. sc., 2-rate, t.s. & spl.	1,718,612	Lighting and traction. Data to Mar. 31, 1909	224
21,312 KW.	193 arc, 438 cbn.	2,356=9,723 H.P.	Abt. 400 cars, 50 H.P. each	27,895 KW. (ex. tr.)	5	Lg. 3½, 3 & 2½; pb. lg. 2; pr. 2, 1½ & 1; tr. ave. for 1903 1.141	Sliding scale & flat rate	35,387,734	Lighting and traction. Data to Dec. 31, 1908	225

N.=Nernst; A.=amperes; A.H.=ampere-hours; ph.=phase; A.C.=alternating current; D.C.=direct current.

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179	HITCHIN	Electric Supply Corporation, Ltd.	1906	K. A. Scott-Moncrieff*	240 & 480	Direct	200	61.2	77 KW.	£18,950	183 KW.	..	7=
180	HOLYHEAD	Holyhead Urban District Council	1904	P. Williams	200 & 400	Direct	220	149	240 KW.	£21,405	212 KW.	9 arc, 452 cbn.	8=
181	HOMLEY	Honley Urban District Council	1904	Harry Marsden (Gen. Man.)	200	Direct	75	26	..	£3,100	80 KW.	2 arc, 99 inc.	3=
182	HORNSEY	Hornsey Corporation	1903	N. Staniland	240 & 480	Direct	1,300	665	250 KW.	£137,966	2,293 KW.	58 arc, 126 inc.	22=
183	HORSHAM	Horsham Urban District Council	1902	J. B. Morgan	230 & 460	Direct	400	178	115 KW.	£28,320	470 KW.	21 arc, 30 cbn., 250 mtl.	14=
184	HOUGHTON-LE-SPRING	Houghton-le-Spring & Dist. Electric Lighting Co., Ltd.	1907	..	220	40~, 3-ph.	Bulk supply*	..	..	..	96 KW.	24 mtl. ..	2,2 (inc.
185	HOVE (ALDRINGTON)	Hove Corporation	1905	H. H. Scott (Boro' Surveyor)	220 & 440	Direct	*	22	..	£9,029	138 KW.	4 mtl. ..	6=1
186	HOVE	Hove Electric Lighting Co., Ltd.	1892	C. B. Smith	220	Direct	1,608	991	36 KW.	£165,483	3,262 KW.	..	115= Rad.
187	HOYLAKE & W. KIRBY	Hoylake & W. Kirby Urban District Council	1901	C. J. Turner	230	50~, 1-ph.	625	330	300 A.H.	£52,019	1,341 KW.	3 arc, 423 cbn., 50 mtl., 8 N.	10=
188	HUDDERSFIELD	Huddersfield Corporation	1893	A. B. Mountain	100, 200, & 400*	100~, 1 ph. 50~, 3-ph.	1-ph. 2,650 3-ph. 5,750	2,412	..	£203,239	5,018 KW.	99 arc, 48 inc. 4 N.	391
189	HULL	Hull Corporation	1893	H. Bell	220 & 440	Direct	6,454	4,724	433 KW.-hrs.	£354,977	6,097 KW.	20 arc, 42 Nernst	5,5
190	ILFORD	Ilford Urban District Council	1901	A. H. Shaw	230 & 460 tr. 500	Direct	3,600	1,675	200 KW.	£170,111	2,629 KW.	106 arc, 1,000 cbn., 540 mtl.	99=
191	ILFRACOMBE	Ilfracombe Electric Light & Power Co., Ltd.	1903	A. A. Jenkins	240 & 480	Direct	330	169	8½ KW.	£32,484	425 KW.	..	43=
192	ILKESTON	Ilkeston Corporation	1903	A. C. Gilbert	230 & 460 tr. 500	Direct	*	..	..	£16,598	1,320 KW.	20 arc, 200 inc.	
193	INGLETON (YORKS)	Ingleton Electric Lighting & Power Co., Ltd.	1900	D. Tattersall	100 & 200	Direct	29	22	12½ KW.	£3,000	63 KW.	36 inc. ..	8=2
194	INVERNESS	North of Scotland Electric Light & Power Co., Ltd.	1905	E. J. Williams	240 & 480	Direct	330	183	100 KW.	£30,451	264 KW.	..	49=
195	IPSWICH	Ipswich Corporation	1903	F. Ayton	230 & 460	Direct	1,511	887	210 KW.	£87,015	1,298 KW.	2 mtl. ..	254=
196	JEDBURGH	Electric Supply Corporation Ltd.	1903	K. A. Scott-Moncrieff*	225 & 450	Direct	66	34	35 KW.	£12,980	83 KW.	9 arc, 12 cbn., 102 Nernst	7=2
197	KEIGHLEY	Keighley Corporation	1901	J. M. Smyth	230 & 460, tr. 500	Direct	740	330	100 KW.	£57,409	333 KW.	18 arc, 24 cbn., 48 N.	108=
198	KENDAL	Kendal Corporation	1902	John A. T. Barnes	220 & 440	Direct	109.5	67	40 KW.	£14,189	160 KW.	..	26=
199	KESWICK	Keswick Electric Light Co., Ltd.	1890	W. Jackson	100	75~, 1-ph.	120	60	..	£13,761	..	3 arc, 20 inc.	
200	KETTERING	Kettering Urban District Council	1904	W. A. Walker	230 & 460	Direct	775	455	70 KW.	£52,902	651 KW.	30 arc, 60 cbn.*, 19 mtl*, 203 N.*	142=
201	KEYNSHAM & KINGSWOOD	Keynsham Electric Light & Power Co., Ltd.	1891	G. J. T. J. Parfitt	230	Direct	75	55	50 KW.	£4,350	119 KW.	6 Nernst, 119 inc.	6=2
202	KIDDERMINSTER	Kidderminster & District Elec. Ltg. & Traction Co., Ltd.	1900	A. Charlton	230 & 460	Direct	1,550	575	220 KW.	£45,774	635 KW.	..	41=
203	KILDARE	Naas Rural District Council	1905	H. Rylance	200	Direct	32	..	..	£3,800	..	..	
204	KILLARNEY	Kerry Electric Supply Co., Ltd.	1893	Valentine Ryan	100	100~, 1-ph.	160	52	..	£7,000	133 KW.	..	
205	KILMACOLM	Kilmalcolm Electric Lighting Co., Ltd.	1903	James Brown	240 & 480	Direct	50	46	20 KW.	£10,000	316 KW.	6 cbn., 6 mtl.	5=7
206	KILMARNOCK	Kilmarnock Corporation	1904	A. H. Burbidge	240 & 480	Direct	755	547	60 KW.	£43,556	583 KW.	50 arc ..	47=2
207	KING'S LYNN	King's Lynn Corporation	1899	J. Pilling	200 & 400	Direct	680	332	60 KW.	£49,836	755 KW.	232 cbn., 233 mtl., 15 N.	76=3
208	KINGSTON-UPON-THAMES	Kingston-upon-Thames Corporation	1893	J. E. Edgcome	105	77~, 1-ph.	860	574	..	£99,651	1,803 KW.	76 arc*, 200 cbn., 35 mtl.	53=2
209	KIRKCALDY	Kirkcaldy Corporation	1902	O. F. Francis	230 & 460, tr. 500	Direct	1,090	811	..	£64,707	759 KW.	104 arc, 212 cbn.	786 H
210	LANCASTER	Lancaster Corporation	1893	W. A. Tester	230 & 460, tr. 525	Direct	1,250	700	..	£63,300	1,770 KW.	41 arc, 84 mtl.	104=
211	LARNE	Larne Electric Light Works, Ltd.	1891	M. G. Smyth	105 & 210	100~, 1-ph.	150	72	..	..	78 KW.	14 arc, 136 inc.	
212	LEAMINGTON	Midland Electric Light & Power Co., Ltd.	1887	Percy Older	115 & 230	Direct	524	238	107 KW.	..	754 KW.	1 arc ..	40=6
213	LEATHERHEAD ASHTEAD & MICKLEHAM	Leatherhead & District Electricity Co., Ltd.	1902	H. Leslie Dixon	220 & 440	Direct	150	91.3	80 KW. (630 A.H.)	£33,450	363 KW.	..	12=3
214	LEEDS	Leeds Corporation	1893	H. Dickinson	100, 200 & 400	50~, 1-ph. & 2-ph.	15,740	8,220	..	£916,914	10,611 KW.	686 arc ..	1,710= H
215	LEEK	Leek Urban District Council	1904	R. M. Carr	230 & 460	Direct	430	177	64.4 KW.	£15,747	233 KW.	..	44=26
216	LEICESTER	Leicester Corporation	1894	A. Colson	100 & 200	50~, 1 ph.	4,400	1,980	..	£238,818	7,020 KW.	..	303= H
217	LEICH	Leigh Corporation	1899	Arthur T. Smith	220 & 440	Direct	760	440	132 KW.	£45,748	679 KW.	..	165= H
218	LEITH	Leith Corporation	1899	A. P. Rutherford	230 & 460 tr .500	Direct	2,830	1,891	75 KW.	£147,558	2,501 KW.*	299 arc ..	415=3,
219	LETCHWORTH	First Garden City Co., Ltd.	1907	Charles Gould	250 & 500	Direct	130	90	40 KW.	..	10 KW.	..	25=90
220	LEWES	Lewes & District Electric Supply Co. Ltd.	1901	C. F. Butler	230 & 460	Direct	330	140	20 KW.	£25,044	371 KW.	..	16=63
221	LEYTON	Leyton Urban District Council	1896	F. Harman Lewis	150 & 300 tr. 500	Direct	3,140	1,050 lg. 910 tr.	64 KW.	£179,233	2,030 KW.	82 arc, 819 cbn., 637 mtl.	85=38
222	LIMAVADY	Limavady Power & Light Works	1897	E. J. S. Ritter	110 & 220	100~, 1-ph.	240	85	..	..	33 KW.	..	
223	LIMERICK	Limerick Corporation	1902	P. T. MacNamara	230 & 460	Direct	360	250	93 KW.	£30,000	..	64 arc ..	
224	LINCOLN	Lincoln Corporation	1898	Stanley Clegg	230 & 460 tr. 500	Direct	1,394	844 lg. 185 tr.	34.5 KW.	£65,151	1,214 KW.	34 arc, 22 cbn., 70 mtl., 3 N.	163=1,
225	LIVERPOOL	Liverpool Corporation	1883	A. Clough (Res.) A. B. Holmes (Con.)	230 & 460, tr. 500	Direct	35,300	17,245	..	£2,050,103	21,312 KW.	193 arc, 498 cbn.	2,356= H.P.

~=cycles per second; lg. = lighting; pb. lg. = public lighting; pr. = power htg. = heating; inc. = incandescent; cbn. = carbon; mtl. = metal filament; N. = Nernst; A. = amperes; A.H. =

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188 KW.	..	7=13 H.P. ..	..	207 KW. ..	50	Lg. 5; pr. 3; htg. 1½	Flat rate	43,764	*Resident engineer, Geo. T. Laverty. Data for 1908 ..	179
212 KW.	9 arc, 452 cbn.	8=5½ H.P. ..	..	253 KW. ..	28	Lg. 5; pb. lg. 3; pr. 3	Flat rate	125,287	Data to Mar. 31, 1908	180
80 KW.	2 arc, 99 inc.	3=6 H.P. ..	..	87 KW.	..	Lg. 4½ (less 8⅓%); pb. lg. 3; pr. 3½	Flat rate with discount	27,114	.. ..	181
2,293 KW.	58 arc, 126 inc.	22=23½ KW.	..	2,331 KW.	35	Lg. 7 & 2, or 5 to 3; pb. lg. 3; pr. 2½ & 1, or 2	Max. demand and flat rate w. rebates	794,212	Data to Mar. 1908	182
470 KW.	21 arc, 30 cbn., 250 mtl.	14=30 H.P.	..	492 KW. ..	16	Lg. 7 & 3, or 6; pb. lg. 4; pr. 3 & 1½	Max. demand and flat rate	190,000 approx.	Data to Mar. 31, 1908	183
93 KW.	24 mtl. ..	2,220 KW. (inc. collieries)	..	2,316 KW.	..	Lg. 4; pb. lg. £1 7s. per lamp per season; pr. 2 less dis.	Flat rate with discounts	..	*Bulk spl. from Durham Col. Elec. Pr. Co., Ltd. Dist. by Newcastle-on-T. Elec. Spl. Co., Ltd. Data to Dec. 31, '08	184
138 KW.	4 mtl. ..	6=12 H.P. ..	..	148 KW ..	16.5	Lg. 7 & 4, or 5; pb. lg. 1.4; pr. 5 & 2, or 3½ (2, time-switch).	Max. demand, flat rate & time switch	27,483	*Bulk supply from Brighton Corporation. Data to Mar. 31, 1909	185
3,262 KW.	..	115=382 KW. Rad.=180 KW	..	3,804 KW.	9.4	Lg. 5½, or 7 & 4; pr. 3 & 1½ ..	Flat rate and max. demand	1,134,994	Data to Dec. 31, 1908	186
1,341 KW.	3 arc, 429 cbn., 50 mtl., 8 N.	10=30 H.P.	..	1,691 KW.	12	Lg. 7 & 3, or 5½; pb. lg. 3½; pr. 3 & 1½, or 2	Max. dem., flat, sl. scale, 2-rate & t.s.	401,602	.. ..	187
5,018 KW.	39 arc, 48 inc. 4 N.	391=2,305 H.P.	..	7,321 KW.	12	Lg. 4; pb. lg. arc £17½, inc. 33s. p.a., pr. 2 & 1 (3-ph., 1 w. dis.)	Flat rate w. dis., sl. scale, cont. & spl.	2,462,046	*100 and 200 volts, 1-ph.; 400 volts, 3-ph. Data to Dec. 31, 1908	188
6,097 KW.	20 arc, 42 Nernst	5,543 H.P.	..	10,250 KW.	6	Lg. 5 & 1½, or 4; pb. lg. arc £33, N. £6; pr. 2 to 1	Max. dem., flat, sl. sc. w. dis., cont., t. sw.	5,903,726	Data to Mar. 31, 1908	189
2,629 KW.	106 arc, 1,000 cbn., 540 mtl.	99=605 H.P.	44=1,100 H.P.	4,393 KW.	8	Lg. 6 & 1, or 3½; pb. lg. arc £18 & £9* p.a.; pr. 2 to 1, or 2 & 1; tr. 1.125	Max. demand, flat rate, & sl. scale	3,235,076	Lighting and traction. *Incandescent, £3½ p.a.; 32 C.P. cbn. or 50 C.P. mtl. Data to Mar. 31, 1909	190
425 KW.	..	43=103 H.P.	..	527 KW.	7	Lg. 7 & 3, or 6; pr. 4 & 1½, or 2½	Max. demand and flat rate	132,427	Data to Dec. 31, 1907	191
1,320 KW.	20 arc, 200 inc.	..	26=650 H.P.	1,355 KW.	3	Lg. 3; pb. lg. 3; pr. 2 to 1½; tr. 1	Flat rate	603,094	*Supply in bulk from Derby & Notts Electric Power Co. Data to Mar. 31, 1908	192
63 KW.	36 inc. ..	8=26 H.P. ..	..	85 KW. ..	..	Lg. 6; pb. lg. 2.9; pr. 3 to 1 ..	Flat rate and contract; pr. sl. scale	19,000	Water power. Data to April 20, 1909	193
264 KW.	..	49=218 H.P.	..	489 KW. ..	92	Lg. 7 & 3, or 6; pr. 4 & 1½, or 2½	Max. demand and flat rate	144,069	Data to Dec. 31, 1907	194
1,298 KW.	2 mtl. ..	254=862 H.P.	72=1,800 H.P.	3,960 KW.	16	Lg. 4 less 5% cash; pb. lg. 1; pr. 2 to 1½; tr. 1½	Flat rate	1,399,990	Lighting and traction. Data to Mar. 31, 1909	195
83 KW.	9 arc, 12 cbn., 102 Nernst	7=24 H.P.	..	111.6 KW.	2.8	Lg. 6; pb. lg. 3; pr. 3; htg. 1½	Flat rate	34,464	*Resident engineer, J. H. Dennison. Data for 1908 ..	196
333 KW.	18 arc, 24 cbn., 48 N.	108=490 H.P.	24=720 H.P.	1,366 KW.	6.8	Lg. 7 & 2, or 4½ to 4; pb. lg. 1.78; pr. 2 to 1; tr. 1.75	Max. dem., flat, sl. scale & cont. w. dis.	522,433	Lighting and traction. Data to June 30, 1907 ..	197
160 KW.	..	26=97 H.P.	..	244 KW.	..	Lg. 6; pr. 2½ to 1½	Flat rate	50,529	Part gas power. Data to Mar. 31, 1909	198
..	3 arc, 20 inc.	..	..	237 KW.	..	Lg. 6; pb. lg. contract; pr. 3 ..	Flat rate	53,568	Part water power.	199
651 KW.	30 arc, 60 cbn.*, 19 mtl*, 203 N.*	142=385 H.P.	..	1,261 KW.	33.7	Lg. 4½ (arc 3); pb. lg. arc £17†; pr. 2 to 1	Flat rate & sliding scale	555,282	*Number of posts fitted. †Inc. £5 5s. all night; £3 3s. half-night. Data to Mar. 31, 1909	200
119 KW.	6 Nernst, 119 inc.	6=26 H.P.	..	151.5 KW.	..	Lg. 6; pb. lg. £226 p.a.; pr. 3 to 2½	Flat rate with discount	58,400	.. ..	201
635 KW.	..	41=919 H.P.	26=680 H.P.	2,319 KW.	10.3	Lg. 7 & 2½ (ave. max. 4½) w. discount; pr. 4½ & 1½	Max. demand w. dis., & 2-rate mr.	1,012,194	Lighting and traction. Data to Dec. 31, 1907	202
..	..	..	..	230 KW.	..	Lg. 5; pr. 2½	Flat rate	..	.. ..	203
183 KW.	..	..	..	150 KW. ..	..	6d. with discounts	Flat rate	..	Part water power	204
316 KW.	6 cbn., 6 mtl.	5=7 H.P. ..	..	315 KW. ..	10	Lg. 6; pb. lg. £1 p.a.; pr. 4 ..	Flat rate	57,000	Data to Dec. 31, 1908. Residential district	205
583 KW.	50 arc ..	47=233 H.P.	28=730 H.P.	757 KW. ..	40	Lg. 4½ w. dis.; pb. lg. £880; pr. 2 w. dis.; tr. 1½	Sliding scale and flat rate	675,000	Lighting and traction. Data to May 15, 1908	206
755 KW.	232 cbn., 238 mtl., 15 N.	76=301 H.P.	..	1,032 KW.	3.3	Lg. 4½ to 4½; pb. lg. 1.78; pr. 3 to 1; htg. 1½	Flat rate and max. demand* & spl.	523,563	Part gas power. *Pr. max. demand; flat rate in day-time. Data to Mar. 31, 1909	207
1,303 KW.	76 arc*, 200 cbn., 35 mtl.	53=219 H.P.	..	1,500 KW.	..	Lg. 5, or 7 & 3; pb. lg. arc £20, 32-C.P. inc. £3½ p.a.; pr. 1½.	Max. demand and flat rate	692,462	*Two 32-C.P. inc. used after midnight. Data to May 7, 1908	208
1,759 KW.	104 arc, 212 cbn.	786 H.P. ..	44=1,232 H.P.	2,334 KW.	24	Lg. 4½ to 3; pb. lg. arc £12 p.a.; pr. 1½ to ¾; tr. 1½	Sliding scale ..	1,881,108	Lighting and traction. Data to May 15, 1908	209
1,770 KW.	41 arc, 84 mtl.	104=440 H.P.	24=640 H.P.	2,300 KW.	10.27	Lg. 4½ (5% dis.); pb. lg. 1½ incl.; pr. 2½ & 1½ w. dis. to 20%; tr. 1.7	Flat, sl. scale, 2-rate & contract, w. dis.	765,450*	Lighting and traction. *Increase only 0.47%, due to bad trade and met.-fil. lamps. Data to Mar. 27, 1909	210
78 KW.	14 arc, 136 inc.	..	..	100 KW. ..	..	Lg. 8 to 1½; pb. lg. 2½ inclusive	Flat rate, contract and special	..	Data for 1908-9	211
754 KW.	1 arc ..	40=69 H.P.	..	816 KW...	9.8	Lg. 7 & 2½, or 5½*; pr. 2½ or £5 p. H.P. p.a. & 1½ p.u.	Max. demand, flat rate & time switch*	255,575	*Time switch and 2-rate meter, 6d. and 2½d. Data to Dec. 31, 1908	212
363 KW.	..	13=37 H.P.	..	400 KW...	15.8	Lg. 6½ to 5; pr. 3 to 2½, or £12½ per KW. p.a. & 2d. p.u.	Flat rate, sl. scale, & 2-rate meter.	123,278	Diesel oil engines. Data to Dec. 31, 1908	213
2,611 KW.	686 arc ..	1,710=9,941 H.P.	..	19,676 KW.	6.6	Lg. 4 & 1; pb. lg. 1½; pr. 1½ to 0.8 (less 5%)	Special scale* and max. demand	12,395,118	*Lg., 4d. first 1,000 hrs. use of lamps, 1d. after; pr. max. demand. Data to Mar. 31, 1903	214
333 KW.	..	44=262 H.P.	..	500 KW...	17	Lg. 7 & 2, or 6 to 3½; pr. 2 to 1	Max. dem., flat, sl. scale, time sw., spl.	315,500	Producer gas power (pressure type), using bituminous fuel. Data to Mar. 31, 1909	215
1,020 KW.	..	303=1,047 H.P.	..	7,801 KW.	..	Lg. 4; pr. 2, or £3 per H.P. p.a. & ¾ p.u.	Flat rate	2,056,141	Max. load reduced owing to general use of metallic-filament lamps. Data to Dec. 31, 1908	216
179 KW.	..	165=1,023 H.P	..	1,444 KW.	..	Lg. 7 & 2, or 4½; pr. 3 & ⅞ (+10% March quarter)	Max. demand & flat rate	769,112	.. ..	217
1,601 KW.*	299 arc ..	415=3,278 H.P.	72=2,160 H.P.	7,606 KW.	10	Lg. 3; pb. lg. arc £14, £10½; pr. 1½; tr. 1	Flat rate, with discount to 25%	2,980,897 May 15 '08	Lighting & traction. *Also 75 radiators=148 KW. Data to April 30, 1909	218
KW.	..	25=90 H.W.	..	100 KW.	300	Lg. 8 & 1½; pr. 1½	Max demand, flat rate, & special*	50,000	*30% of output supplied to the Co. for pumping, at ¾d. per unit	219
1 KW.	..	16=65 H.P.	..	411 KW...	11.8	Lg. 7 & 2½, or 5; pr. 4½ & 1½, or 2½	Max. demand & flat rate	122,758	Data to Dec. 31, 1908	220
030 KW.	82 arc, 819 cbn., 637 mtl.	85=232 H.P.	120=3,600 H.P.	5,700 KW.	5.9	Lg. 5 & 2, or 4*; pr. 3 & 1, or 1½; tr. 1½	Max. demand & flat rate	3,533,398	Lighting and traction. *Pb. lg. arc £21, inc. £4.3.6 (two 40-C.P.) per annum. Data to Mar. 31, 1909	221
KW.	..	..	..	33 KW. ..	..	10s. per 8-C.P.	Contract	..	Water power	222
..	64 arc ..	..	..	400 KW...	..	Lg. 5; pr. 3 & 1½..	Flat rate with discounts	260,000	Producer gas power. Data to Dec. 31, 1908	223
214 KW.	34 arc, 22 cbn., 70 mtl., 3 N.	163=1,130 H.P.	16=420 H.P.	2,376 KW.	5.9	Lg. 5 & 2½, or 4½ (ch. 4); pb. lg. 5 &2½ net; pr. 2 & 1, or 2½, 2; tr. 1½	Max. dem., flat w. dis., sl. sc., 2-rate, t.s. & spl.	1,718,612	Lighting and traction. Data to Mar. 31, 1909	224
312 KW.	193 arc, 438 cbn.	2,356=9,723 H.P.	Abt. 400 cars, 50 H.P. each	27,895 KW. (ex. tr.)	5	Lg. 3½, 3 & 2½; pb. lg. 2; pr. 2, 1½ & 1; tr. ave. for 1908 1.141	Sliding scale & flat rate	35,387,734	Lighting and traction. Data to Dec. 31, 1908	225

=Nernst; A.=amperes; A.H.=ampere-hours; ph.=phase; A.C.=alternating current; D.C.=direct current.

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ICITY SUPPLY WORKS OF TH

	Place.	Supply Authority.	Year of opening.	Engineer.	Pressure of supply, volts.	Frequency and phase.	Total capacity of plant in KW.	Max. load recorded in KW.	Storage battery, max. discharge.	Total capital expended.	Private lighting.	Public lighting.
226	LLANDILO	Llandilo Urban District Council	1902	D. P. Davies ..	230	Direct ..	120	39	23 KW.	£7,000	..	105 cbn. ..
227	LLANDRINDOD WELLS	Llandrindod Wells Electric Light and Power Co., Ltd.	1897	J. Brown ..	230 & 460	Direct ..	260	..	..	..	..	..
228	LLANDUDNO	Llandudno Urban District Council	1898	H. Morton ..	220 & 440	Direct ..	700	460	36 KW.	£39,977	824 KW.	48 arc, 8 inc.
229	LLANGOLLEN	Llangollen & District Electric Light and Power Co., Ltd.	1904	E. Bremner Smith	220	Direct ..	70	37	120 A.	£3,833	..	6 arc, 80×5 mtl.
230	LLANRWST AND TREFRIW	Llanrwst Electricity Supply Co., Ltd.	1899	J. H. Targett ..	220	Direct ..	156	46	12 KW.	£9,742	96 KW.	94 mtl. ..
231	BATTERSEA	Battersea Corporation ..	1901	F. A. Bond ..	230 & 460	Direct ..	2,000	1,370	500 KW.	£220,000	1,680 KW.	381 arc, 209 Nernst
232	BERMONDSEY	Bermondsey Corporation ..	1902	W. E. J. Heenan	240 & 480	Direct ..	975	682	70 KW.	£117,000	782.5 KW.	168 arc, 608 inc., 3 Nerns
233	CHELSEA	Chelsea Electricity Supply Co., Ltd.	1889	Percy Still ..	200 & 400	Direct ..	3,500	2,657	..	£483,204	..	..
234	CITY OF LONDON ..	City of London Electric Lighting Co., Ltd.	1891	F. Bailey ..	204 & 410 D.C., 204 A.C.	Direct & 100~, 1-ph.	26,000	19,168	..	£2,103,920	..	..
235	FINSBURY	County of London Electric Supply Co., Ltd.	1897	C. P. Sparks ..	104 A.C., 550 D.C.	50~, 2-ph., & direct	5,550	4,180	595 KW.	£1,553,786*	15,844 KW.*	..
236	FULHAM	Fulham Borough Council ..	1901	Arthur J. Fuller	200	50~, 2-ph.	2,950	1,780	..	£235,112	95,228 KW.	274 arc, 626 mtl.
237	GREENWICH, LEWISHAM PENGE & SYDENHAM*	South Metropolitan Electric Light & Power Co., Ltd.	1900	H. W. Bowden (Man. Dir.)	200	50~, 2-ph.	6,000	2,520	..	£553,250	5,921 KW. inc. motors	..
238	HACKNEY	Hackney Borough Council ..	1901	L. L. Robinson	240 & 480	Direct ..	4,800	2,218	300 KW. for 4 hrs.	£305,000	2,998 KW.	498 arc, 49 N
239	HAMMERSMITH ..	Hammersmith Corporation ..	1897	G. G. Bell ..	110 & 220	50~, 1-ph.	5,000	3,710	..	£275,444	2,917 KW.	264 arc, 65 in
240	HAMPSTEAD	Hampstead Corporation ..	1894	G. H. Cottam ..	105 & 210	90~, 1-ph.	5,190	3,237	..	£390,930	10,624 KW.	122 arc, 15 mtl.
241	ISLINGTON	Islington Borough Council ..	1896	Albert Gay ..	100, 200 & 400	50~, 1-ph.	5,100	3,485	30 KW. for 3 hrs.	£458,710	4,856 KW.	610 arc ..
242	KENSINGTON	Brompton and Kensington Electricity Supply Co., Ltd.	1889	Henry W. Bowden	100	83~, 1-ph.	2,700	2,060	..	£271,060	..	16 arc ..
243	KENSINGTON (N. OF HIGH STREET)	Notting Hill Electric Lighting Co., Ltd.	1891	Geo. Schultz ..	200	Direct ..	3,000*	1,450	260 KW.	£237,742	5,438 KW.	52 arc ..
244	KENSINGTON AND KNIGHTSBRIDGE	Kensington & Knightsbridge Electric Lighting Co., Ltd.	1887	H. W. Miller ..	200	Direct ..	6,000*	3,812	1,100 KW.	£282,387	..	44 arc ..
245	KENSINGTON AND NOTTING HILL	Jt. Ctee. of K. & Knightsbridge & Notting Hill E. L. Cos.	1900	H. W. Miller and G. Schultz	5,250	48~, 3-ph.	9,000	3,700	15 KW.	£213,287	..	..
246	LAMBETH	South London Electric Supply Co., Ltd.	1899	H. W. Sprunt ..	220	50~, 1-ph.	3,800	2,180	..	£366,465	4,593 KW.	25 arc ..
247	LONDON* & WESTMINSTER	London Electric Supply Corporation Ltd.	1885	G. W. Partridge	100 & 200 A.C. 230 & 460 D.C.	85~, 1-ph., & direct†	17,250	8,268	..	£1,194,105	8,390 KW.	..
248	MARYLEBONE	Marylebone Corporation ..	1887	F. A. Wilkinson*	240 & 480	Direct ..	12,000	7,406	4,950 KW.	..	14,881 KW.	87 flame arc
249	MID LONDON AND PADDINGTON	Metropolitan Electric Supply Co., Ltd.	1887	J. S. Highfield..	100 & 200	60~, 1-ph. & 2-ph.	18,500	9,750 (inc. bulk)	2,400 KW.	£1,874,559	19,926 KW.	..
250	POPLAR	Poplar Corporation	1900	J. H. Bowden ..	230 & 460	Direct ..	3,400	1,224	180 KW.	£187,000	..	320 arc, 528 inc.
251	ST. JAMES' WESTMINSTER	St. James & Pall Mall Electric Light Co., Ltd.	1889	S. T. Dobson .	107 & 214	Direct ..	9,880	5,820	180 A.	£431,309	9,527 KW.	66 arc ..
252	ST. PANCRAS	St. Pancras Borough Council	1891	S. W. Baynes ..	110, 220 & 440	Direct ..	5,880	4,141	..	£587,654	7,610 KW.	945 arc, 2 cbn 68 mtl.
253	SHOREDITCH	Shoreditch Borough Council	1897	C. Newton Russell	150, 240 & 480	Direct ..	6,055	2,772	60 KW. for 6 hrs.	£354,937	..	322 arc ..
254	SMITHFIELD MARKETS	Smithfield Markets Electric Supply Co., Ltd.	1897	E. Dowling ..	100 & 200	Direct ..	965	736	..	£120,442	1,140 KW.	618 cbn. ..
255	SOUTHWARK	Southwark Corporation ..	1899	D. M. Kinghorn	220 & 440	Direct ..	1,212	820	92 KW.	£92,223	1,188 KW.	99 arc, 4 cbn.
256	STEPNEY	Stepney Borough Council ..	1899	W. C. P. Tapper	240 & 480	Direct ..	3,720	3,248	50 KW.	£322,389	3,797 KW.	1 mtl., 162 N 483 arc, 14 mtl 108 N.
257	STOKE NEWINGTON ..	Stoke Newington Corporation	1902	S. Hann.. ..	240 & 480	Direct ..	240*	225	55 KW.	£26,459	283 KW...	9 arc ..
258	WANDSWORTH	County of London Electric Supply Co., Ltd.	1897	C. P. Sparks ..	235	50 ~, 2-ph.	5,450	3,970	..	£1,533,786*	15,844 KW.	..
259	WESTMINSTER ..	Westminster Electric Supply Corporation, Ltd.	1891	Sir A. B. W. Kennedy	200 & 400	Direct ..	17,225*	10,616	..	£1,164,287	..	966 arc, 212 mtl.
260	WESTMINSTER & ST. JAMES	Central Electric Supply Co., Ltd.	1902	Sir A.B.W.Ken'dy S. T. Dobson*	6,000	50~, 3-ph.	10,780	8,336	450 A.H. (stn. ltg.)	£514,781	..	..
261	WESTMINSTER, HOLBORN & CITY OF L.	Charing Cross, West End & City Electricity Supply Co.	1891	H. W. Kingston	100, 200 & 400*	Direct ..	20,400	13,112	3,075 KW. (normal)	£2,343,080	23,544 KW.	166 arc ..
262	WOOLWICH, PLUMSTEAD & ELTHAM	Woolwich Corporation ..	1893	G. W. Keats ..	210 & 420*	Direct* ..	1,728	737	..	£168,965	1,372 KW.	77 arc, 154 inc 18 Nernst
263	LONDONDERRY	Londonderry Corporation ..	1894	R. V. Macrory ..	230 & 440	Direct ..	700	423	500 A.H.	£54,532	402 KW.	185 arc, 97 cbn 4 mtl.
264	LONG EATON	Harrington Electric Light Co., Ltd.	1897	W. B. Smith ..	115	Direct ..	210	120	..	£5,490	133 KW.	..
265	LONG EATON	Long Eaton Urban District Council	1903	F. Worrall ..	230	Direct ..	450	242	..	£23,864	463 KW.	2 arc, 290 inc 92 Nernst
266	LONGTON	Longton Corporation.. ..	1901	W. Langford ..	230	Direct ..	300	131	48 KW.	£24,191	324 KW. ..	..
267	LOUGHBOROUGH ..	Loughborough Corporation ..	1904	W. H. Allen ..	220 & 440	Direct ..	500	285	166 KW.	£31,721	332 KW.	2 arc, 38 mtl
268	LOWESTOFT	Lowestoft Corporation ..	1901	G. A. Bruce ..	230 & 460	Direct ..	1,475	863	..	£81,963	1,190 KW.	81 arc, 361 inc
269	LUDLOW	Ludlow Electric Light Co., Ltd.	1907	Edwards and Armstrong	230	Direct ..	75	30	57.5 KW.	£4,020	70 KW.	2 mtl. ..
270	LUTON	Luton Corporation	1901	W. H. Cooke ..	250 & 500	Direct ..	647	353	120 KW.	£36,679	623 KW...	10 arc, 24 inc 3 Nernst
271	LYME REGIS	Lyme Regis Electric Light & Power Co.	1909 (June 1)	.. .. ..	110	Direct ..	50	..	38.5 KW.	£3,500	81 KW.	122 mtl. ..
272	LYMINGTON	Lymington Electric Light & Power Co., Ltd.	1900	Glynn Salter ..	240	Direct ..	150	102	55 KW.	£36,348	436.5 KW.	67 mtl., 47 N.
273	LYNTON & LYNMOUTH	Lynton & Lynmouth Electric Light Co., Ltd.	1890	P. T. Kimmins	100	100~, 1-ph.	175	89.5	..	£8,000	160 KW,	90 cbn., 12 mtl
274	MACROOM	Macroom Electric Light Co.*	1899	D. E. McDonnell	230	100~, 1-ph.	150	47	..	..	67 KW.	87 inc. ..
275	MAIDENHEAD	Maidenhead Corporation ..	1902	C. O. Milton ..	230 & 430	Direct ..	406	275	100 KW.	£42,000	677 KW...	55 arc, 104 N., 50 mtl.
276	MAIDSTONE	Maidstone Corporation ..	1901	E. E. Hoadley ..	2 0 & 460, tr. 500	Direct ..	1,250	827	188 KW.	£74,000	920 KW.	71 arc., 25 cbn. 153 mtl., 210 N
277	MALTON & NORTON	Northern Counties Electricity Supply Co., Ltd.	1904	J. Chandler (Res.)*	230 & 460	Direct ..	80	98	..	..	164 KW.	..
278	MALVERN	Malvern Urban District Council	1904	W. J. Rendell Baker	100 & 200	50~, 1-ph.	250	110	..	£21,000	477 KW.	..
279	MANCHESTER	Manchester Corporation ..	1893	S. L. Pearce ..	100, 200, & 400 D.C.*	Direct, and 50~, 3-ph.*	33,800	25,180	480 KW.	£2,388,378	20,938 KW.	41 arc ..
280	MANSFIELD	Mansfield Corporation ..	1903	E. Holcombe Hewlett	240 & 480 tr. 550-600	Direct ..	720	305 lg. 500 tr.	280 KW. (1 hour)	£71,656*	555 KW.	40 arc, 12 Nernst
281	MARDY (GLAM.) ..	Mardy Electric Light Co., Ltd.	1898	W. W. Ross ..	230*	Direct ..	60	49	12 KW.	£3,000	138 KW.	2 arc, 60 mtl.
282	MARGATE & BROADSTAIRS & S. PETERS	Isle of Thanet Electric Tramways & Lighting Co., Ltd.	1903	J. A. Forde ..	240 & 480, tr. 500-550	Direct ..	1,100	950	60 KW.	..	290 KW.	22 arc ..
283	MARKET DRAYTON ..	Market Drayton Electric Light & Power Co., Ltd.	1903	C. F. Bottomley	240 & 480	Direct ..	90	66.5	43.2 KW.	£15,862 (1907)	234 KW.	..
284	MELROSE	Electric Supply Corporation, Ltd.	1904	K. A. Scott-Moncrieff*	225 & 450	Direct ..	66	24	35 KW.	£10,300	68.7 KW.	2 cbn., 44 N.
285	MELTON MOWBRAY ..	Melton Mowbray Electric Light Co., Ltd.	1900	J. E. Edmundson	240 & 480	Direct ..	300	163	86 KW.	£40,003	400 KW.	8 arc, 158 cbn., 14 N.
286	MERTHYR TYDFIL ..	Merthyr Electric Traction and Lighting Co., Ltd.	1901	L. W. Dixon ..	230 & 460	Direct ..	820	lg. 271, tr. 297	380 A.H.	£47,028	514 KW...	14 arc ..
287	MEVAGISSEY	Mevagissey Electric Supply Co., Ltd.	1896	R. F. Browne ..	110	Direct ..	40	8.12	11.6 KW.	£1,600	20.2 KW.	57 mtl. ..
288	MEXBOROUGH	Mexborough Urban District Council	1902	John Senior ..	220 & 440	Direct ..	300	220	.50 KW.	£20,640	378 KW.	15 arc, 256 cbn.
289	MIDDLESBROUGH ..	Middlesbrough Corporation ..	1901	Horace M. Taylor	230 & 440	Direct ..	1,600	1,238	176 KW.	£107,000	2,027 KW.	..
	MIDDLETON	Middleton Corporation ..	1902	S. Pauls	220 & 440 tr. 500	Direct ..	768	760	44 KW.	£40,255	235 KW.	18 arc, 36 cbn.

LONDON.

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al tal ded.	Private lighting.	Public lighting.	No. and B.H.P. of private motors.	No. and H.P. of traction motors.	Total connections of all kinds.	Percentage increase during year.	Price charged per unit, pence.	System of charging.	Units sold during last complete year.	Remarks.	
000	..	105 cbn. ..	3=7 H.P.	..	..	..	Lg 6; pb. lg. 3; pr. 3	Flat rate	24,500	Data to Oct., 1908	226
	..	..	..	..	..	..	Lg. 6; pr. 6 to 3½	Flat rate & scale ..	120,000	.. ..	227
977	824 KW.	48 arc, 8 inc.	24=86 H.P...	..	1,000 KW.	..	Lg. 7 & 2½, or 5½; pb. lg. 1.5; pr. 2	Max. demand, flat rate & contract	484,000	Max. load in summer	228
833	..	6 arc, 80×2 mtl.	2=8 H.P. ..	..	..	..	Lg. 7 & 4; pb. lg. 3, & cont.; pr. 4 min. 10s. per H.P. per qr.)	Max. demand & flat rate	27,864	.. ..	229
742	96 KW.	94 mtl. ..	5=7 H.P. ..	..	101 KW.	15	Lg. 5; pb. lg. 2d/- per 2×25 c.p. tant. to 11 p.m.; pr. 3	Sl. scale with dis., & contract	36,765	Data to Dec. 31, 1908	230
000	1,680 KW.	381 arc, 205 Nernst	620 H.P. ..	..	2,480 KW.	..	Lg. 3½; pb. lg. arc £18 p.a.; pr. 1	Flat rate	2,160,000	.. ..	231
000	782.5 KW.	168 arc, 608 inc., 3 Nernst	1,403 H.P. ..	..	2,100 KW.	..	Lg. 6 & 2; pb. lg. 1½; pr. 1½ & ¾	Max. demand ..	1,564,000	.. ..	232
004	..	..	..	..	7,580 KW.	..	Lg. 5½ & under; pr. 1½	Flat rate	8,654,608	Data to Dec. 31, 1908	233
,920	..	..	..	..	35,742 KW.	6	Average obtained, lg. & pr. 2.55	Flat rate, sliding scale, etc.	24,560,406	Data to Dec., 1908	234
786*	15,844 KW.*	..	9,517* H.P....	..	25,361 KW.*	..	Lg. 5 (bus.), 5½ (pr. ho.), 3 (bsmnt.); pr. 2½ to 1½; htg. 1½	Flat rate, sl. scale & contract	10,755,424*	Data to Dec. 31, 1906. *Jointly with Wandsworth.	235
112	95,228 KW.	274 arc, 626 mtl.	154=1,265 H.P.	..	4,029 KW.	..	Lg. 3½ (basct. 2, midnight to sunset); pb. lg. 1.2; pr. 1	Flat rate	3,165,784	Data to Mar. 31, 1909	236
350	5,921 KW. inc. motors	..	..	..	5,921 KW.	13.6	Lg. 6 w. dis.; pr. £4+0.75 d.p.u., and special by agreement	Flat rate, & agreement with dis.	3,303,827	*Also Blackheath, Catford, C. Palace, &c., and parts of Lambeth & Camberwell. Data to Dec. 31, 1908	237
000	2,998 KW.	498 arc, 49 N.	445=2,121 H.P.	..	4,821 KW.	23.7	Lg. 3½, or 6 & 1; pb. lg. arc £18, £12, £11, N. £4 p.a.; pr. 1½*	Max. demand and flat rate*	3,852,000 (estimated)	*Also £1 per KW. per qr. & ½d. p.u.; churches 3d. p.u. Data to Mar., 1908	238
444	2,917 KW.	264 arc, 65 inc.	260=1,727 H.P.	..	4,259 KW.	..	Lg. 3; pb. lg. arc £20 and £7½ p.a.; pr. 1½ to 1	Flat rate	4,223,008	.. ..	239
930	10,624 KW.	122 arc, 12 mtl.	97=540 H.P.	..	11,546 KW.	..	Lg. 6 & 1½, or 4*; pb. lg. arc £263 p.a.; pr. 1 & 1½; htg. 1½	Max. demand and flat rate	4,421,527	* Arc lighting 3½d. & 1½d. Data to Mar. 31, 1909 ..	240
710	4,856 KW.	610 arc ..	334=1,680 H.P.	..	6,344 KW.	16.82	Lg. 3½; pb. lg. £15,734 p.a.; pr. 1	Flat rate, sliding scale & contract	4,789,694	Data to Mar. 31, 1908 (approx.)	241
000	..	16 arc ..	63=292 H.P.	..	7,869 KW.	5.1	Lg. 5½ to 4 (shops &c. 3½, bts. 3 to 2); pb. lg. 1; pr. 1 subject to ½d. factor	Flat rate with discounts	2,876,466	Data to Dec. 31, 1908	242
742	5,438 KW.	52 arc ..	61=215 KW.	..	5,629 KW.	5	Lg. 5 w. dis. to 20%; pb. lg. 1; pr. 2 to ½	Sliding scale or flat rate	2,037,395	*Inc. steam plant battery & motor-generators. Bulk supply from Wood Lane Works. Data to Dec. 31, 1908	243
387	..	44 arc ..	178=950 H.P.	..	13,500 KW.	7	Lg. 5 & 3; pb lg. 1; pr. 3 to 1; tr. 3 to ¾	Flat rate & scales with discounts	5,828,735	*Motor-generators, 4,000 KW.; 1,800 KW. received from Wood Lane Works. Data to Dec. 31, 1908	244
287	..	..	..	..	..	..	.. ..	..	8,939,913	Bulk supply to Cos. named; motor-genrs., 6 000 KW. in 5 sub-stns. Res. eng. C. M. Bennett. Data to Dec. 31, '08	245
465	4,593 KW.	25 arc ..	383=2,256 H.P.	..	6,264 KW.	15.8	Lg. 7 & 2, or 4½; pr. spl. rates..	Max. dem., flat rate & contract	3,132,820	Data to Dec. 31, 1908	246
,105	8,390 KW.	..	3,290 H.P. ...	..	10,857 KW.	13	Lg. 5½ to 3½, or 6 & 3; pr. 2½ to ¾	Sliding scale or max. demand	13,160,130	*Berm'sey, Ch'sea, D'ford, Gr'wich, So'wark, parts C'well, Fins'y & L'beth. †Also 25~, 3-ph. Data to Dec. 31, '08	247
	14,891 KW.	87 flame arc	450=1,230 H.P.	..	17,125 KW.	8.44	Lg. 8 & 1 (flat rate 2 for day load, etc.); pr. 2 & 1	Max. demand and flat rate	8,797,111	*Resigned; A. H. Seabrooke appointed to follow. Data to Mar. 31 1908	248
,559	19,926 KW.	..	4,203 KW. ... inc. htg.	..	24,129 KW.*	9.4	Lg. 5 to 5½; pr. 3 & ¾	Max. demand, flat rate, & 2-rate mtr.	11,617,219	*Excluding bulk supply to Acton. Data to Dec. 31, 1908	249
000	..	320 arc, 526 inc.	130=1,705 H.P.	..	4,667 KW.	..	Lg. 5 & 3; pb. lg. 1½; pr. 1½ ..	Max. demand and flat rate	3,041,000	.. ..	250
309	9,527 KW.	66 arc ..	1,618 KW., mtr. 584 KW., htg.	..	11,729 KW.	5	Lg. 5½ & 4 (basements 3 & 2); pb. lg. arc £17 p.a.; pr. 1	Flat rate & sliding scale	9,527,232	Motor-generators, 4,340 KW.; bulk supply from Central Electric Supply Co., Ltd. Data to Dec. 31, 1908	251
554	7,610 KW.	945 arc, 2 cbn., 68 mtl.	770=3,754 H.P.	..	11,165 KW.	..	Lg. 6 & 1½, or 4; pb lg. 3; pr. 1	Max. demand and flat rate	7,617,039	Data to Mar. 31, 1908	252
937	..	322 arc ..	700=3,454 H.P.	..	6,667 KW.	..	Lg. 5 & 2, or 4 (bsmnts. 3½); pb. l.t. 2½; pr. 2, or ¾d. p.u. + £3 per H.P.	Max. demand and flat rate	4,695,033	High pressure D.C. with transformers 1,100 v. to 150 v., etc. Data to Mar. 31, 1908	253
442	1,140 KW.	618 cbn. ..	517 H.P. ..	..	1,550 KW.	2	Lg. 6 to 3½*; pr. 2½ to 1 ..	Sliding scale ..	2,025,575	*Including wiring, maintenance, & lamp renewals. Data to Dec. 31, 1908	254
226	1,188 KW.	99 arc, 4 cbn., 1 mtl., 162 N.	86=515 H.P.	..	1,688 KW.	14	Lg. 6 & 1, or 4½; pb. lg. 1½; pr. 3 & 1, or 2½; htg. 1	Max. dem., flat, con. w. dis. & special	1,401,845	Data to Mar. 31, 1908	255
389	3,797 KW.	488 arc, 14 mtl., 108 N.	681=5,294 H.P.	..	9,334 KW.	26.7	Lg. 8 & 1, or 6 & 0.9; pb. lg. 6 & 0.9; pr. 1*	Max. demand and flat rate	6,833,885	*Or 5s. per HP. per month, & ½d. per unit. Data to Mar. 31, 1909.	256
459	283 KW. ..	9 arc ..	21=60 KW.	..	351 KW.	4	Lg. 7 & 2, or 5; pr. 5 & 1, 4 & 1, or 3, 2	Max. dem., flat rate, 2-rate mr. & cont.	214,683	*Bulk supply at 10,000 v. from North Met. Electric Power Supply Co. Data to Mar. 31, 1908	257
786*	15,844 KW.	..	317 KW.	..	25,361 KW.*	..	Lg. 5 (bus.), 5½ (pr. ho.), 3 (bsmnt.); pr. 2½ to 1½; htg. 1½	Flat rate, sl. scale & contract	10,755,424*	Data to Dec. 31, 1906. *Jointly with Finsbury	258
,287	..	966 arc, 212 mtl.	..	..	32,838 KW.	5.98	Lg. 5½, 4½ & 3½; pb. lg. arc £23 less 3½%; pr. 1	Sliding scale and flat rate	18 315,792	*Of this 9,230 KW. in motor-generators; bulk supply from Central Elec. Supply Co. Data to Dec. 31, 1908	259
781	..	..	..	..	..	..	Bulk supply	Flat rate	18,859,180	*Resident engineer, H. P. Gaze. Bulk supply to Westminster & St. James Cos. Data to Dec. 31, 1908	260
089	23,544 KW.	166 arc ..	12,912 H.P...	..	32,228 KW. + bulk	8.1	Lg. 6 to 3; pr. 3 to ¾	Flat rate, sliding scale & contract	21,745,698	*Bulk supply 1,000 and 10,000 v. Data to Dec. 31, 1908	261
965	1,372 KW.	77 arc, 154 inc., 18 Nernst	320 H.P.	..	1,703 KW.	..	Lg. 7 & 2½, or 4; pr. 2 to 1½ ..	Max. demand, flat rate & scale	1,000,000	*200 v., A.C., 50~ 1-ph., for Eltham only	262
532	402 KW.	185 arc, 97 cbn. 4 mtl.	62=356 H.P.	..	866 KW. ..	10	Lg. 6 & 1½, or 4½*; pr. 2 to 1; htg. 1	Max. dem., flat rate & sliding scale	645,954	*Pb. lg. arc £18.9, inc. (32 c.p.) £3.2 p.a. Data to Mar. 31, 1909	263
330	133 KW.	..	..	..	161 KW. ..	..	Lg. 5½	Flat rate	..	.. ..	264
984	463 KW.	2 arc, 290 inc., 92 Nernst	57=140 H.P.	..	628 KW.	..	Lg. 3½ to 2; pb. lg. 2; pr. 2½ to ¾	Flat rate & scale ..	..	.. ..	265
191	324 KW. ..	..	58=151 H.P.	..	437 KW.	16	Lg. 8 & 2, or 6; pr. 2½ to 1½ (all less 5%)	Max. demand, flat rate & sl. sc. w. dis.	188,573	Data to Mar. 31, 1908	266
221	332 KW.	2 arc, 38 mtl.	68=382 H.P.	..	656 KW. ..	6.3	Lg. 4 (factories 3); pb. lg. 2½; pr. 1	Flat rate	268,372	Data to Mar. 31, 1909	267
963	1,190 KW.	81 arc, 361 inc.	81=457 H.P.	40=1,000 H.P.	2,328 KW.	..	Lg. 4½; pb. lg. 3; pr. 2 & 1½; tr. 2	Flat rate	1,049,402	Lighting & traction. Data to Sept 30, 1908	268
920	70 KW.	2 mtl. ..	6=5½ H.P. ..	..	76 KW.	..	Lg. 7 with discounts; pb. lg. 4; pr. 4 & 2	Flat rate with discounts	18,100	Data to Dec. 1908	269
879	623 KW...	10 arc, 24 inc., 3 Nernst	114=545 H.P.	..	1,142 KW.	..	Lg. 6 & 2, or 4; pb. lg. 2; pr. 2, 1½ & 1	Max. demand, flat rate & sl. scale	..	.. ..	270
00	31 KW.	122 mtl. ..	2=3 H.P. ..	..	40 KW.	..	Lg. 6; pb. lg. contract; pr. 6 ..	Flat rate & contract	..	.. ..	271
848	486.5 KW.	67 mtl., 47 N.	24=78 H.P.	..	559.6 KW.	..	Lg. 7 & 4, or 2½; pb.lg. £2½ & £2⅝ p.a.; pr. 4 & 1½, or 2½	Max. demand & flat rate	121,400	Data to Dec. 31, 1908	272
00	160 KW.	90 cbn., 12 mtl.	4=15 H.P. ..	..	187 KW. ..	..	Lg. 5; pb. lg. inc. £2½ p.a.; pr. 2½	Flat rate, 2-rate mtr. and contract	131,790	Part water power. Data to Mar. 25, 1908	273
	67 KW.	87 inc. ..	..	..	77.5 KW.	..	Lg. 4½, or 1s. per c.p. p.a.; pb. lg. total £180 p.a.	Flat rate and contract	..	Part water power. *T. Smith, Astley, proprietor. ..	274
00	677 KW...	55 arc, 104 N., 50 mtl.	38=125 H.P.	..	767 KW.	..	Lg. 5; pb. lg. arc £18½ to £10, inc. £3 p.a.; pr. 2 to 1½	Flat rate and max. demand	..	.. ..	275
00	920 KW.	71 arc., 25 cbn., 153 mtl., 210 N.	1,196 H.P. ..	40=1,000 H.P.	1,888 KW.	13	Lg. 7 & 2, or 4; pb. lg. 1 4; pr. 2 to 1; htg. 1; tr. 1.5	Max.dem.& flat rate; sl. sc. for pr.	1,518,881	Lighting and traction. Data to Mar. 31, 1909	276
	164 KW.	..	66 KW. ..	..	230 KW.	..	Lg. 4½; pr. 2½ to 1½	Flat rate & sliding scale	..	Norton supplied from Malton. *C.W. Fairweather (Mgr.). Cons. engrs. Merz & McLellan. Data to Dec. 31, 1908	277
00	477 KW.	..	13=36.5 H.P.	..	506 KW. ..	22.1	Lg. 6, first 2½ units per 8-C.P. per qr., all above, 4; pr. 3	Special scale and flat rate	114,153	Data to Mar. 31, 1909	278
78	20,938 KW.	41 arc ..	2,805=17,462 H.P.	See other Table	34,507 KW. (ex. tr.)	..	Lg. 4½ & 1½; pb. lg. 2; pr. 1½ to 1; tr. 1½ approx.	Max. demand and sliding scale	47,564,903	Lighting and traction, three stations. *A.C. 6,500 volts.	279
56*	555 KW.	40 arc, 12 Nernst	76=242 H.P.	42=1,306 H.P.	1,969 KW.	9.9	Lg. 7 & 1; pr. 4 & 1 (day 1); tr. 1½ to 1	Max. demand and 2-rate meters	1,068,354	Lg. & tr. Comparative decrease in output due to metal lamps. *Incl. destructor, £13,400. Data to Mar. 31, '09	280
00	138 KW.	2 arc, 60 mtl.	5=10 H.P.	..	163 KW.	..	Lg. 4½; pb. lg. arc £12½, mtl. £3½ p.a.	Flat rate	60,000	Overhead mains. *Private lg. 220 volts 2-wire; public lg. 110 volts 3-wire	281
	290 KW.	22 arc ..	7=35 KW.	120=3,000 H.P.	768 KW. (ex. tr.)	..	Lg. 5 with discount; pb. lg. 2½; pr. 3 with di count	Flat rate with discounts	1,500,000	Lighting and traction station. Data to Sept. 30, 1908	282
62)	234 KW.	..	25=90 H.P.	..	326 KW. ..	..	Lg. 7 & 4; pr. 2½	Max. demand & flat rate	57,222	Data for 1908	283
00	68.7 KW.	2 cbn., 44 N.	9=28 H.P.	..	96.6 KW.	8.2	Lg. 6; pb. lg. 3; pr. 3; htg. 1½	Flat rate	21,562	*Resident engineer S. Johnston. Gas power. Data for 1908	284
00	400 KW.	8 arc, 158 cbn., 14 N.	48=197½ H.P.	..	600 KW. ..	4	Lg. 5½; pb. lg. £325 p.a.; pr. 4 & 1½, or 2½	Lg. flat & contract; pr. m.d. & flat	228,360	Data to Dec. 31, 1908	285
38	514 KW...	14 arc ..	100½ H.P.	30=990 H.P.	1,604 KW.	..	Lg. 7 & 2*; pb. lg. £16.8 p.a.; pr. 4½ & 1½; tr. 1½	Max. demand* and flat rate	642,735	Lighting and traction. *Max. average, 3¾d. Data to Dec. 31, 1907	286
00	20.2 KW.	57 mtl. ..	..	..	22.2 KW.	10	Lg. 6; pb. lg. contract	Flat rate and contract	9,700	Data to April, 1909	287
40	378 KW.	15 arc, 256 cbn.	20=64 H.P.	..	470 KW.	12	Lg. 3, 3½, 4; pb. lg. 2.08; pr. 1½, 2, 2½	Flat rates	306,327	Data to Mar. 31, 1909	288
00	2,027 KW.	..	1,460 H.P.	..	3,120 KW.	..	Lg. 6 & 2, or 4; pr. 2 & 1	Max. demand & flat rate	1,663,000	Motors on hire-purchase	
55	285 KW.	18 arc, 36 cbn.	67=450 H.P.	See other	360·5 KW. (ex. tr.)	..	Lg. 4 to 3; pb. lg. 3; pr. 2 to	Flat rate and	..	Lighting and traction	

264	LONG EATON	Harrington Electric Light Co., Ltd.	1897	W. B. Smith ..	115	Direct ..	210	120	..	£5,430	133 KW.		4 mtl.
265	LONG EATON	Long Eaton Urban District Council	1903	F. Worrall ..	230	Direct ..	460	242	..	£23,864	463 KW.		2 arc, 290 in 92 Nernst
266	LONGTON	Longton Corporation	1901	W. Langford ..	230	Direct ..	300	181	48 KW.	£24,191	324 KW. ..		..
267	LOUGHBOROUGH ..	Loughborough Corporation ..	1904	W. H. Allen ..	220 & 440	Direct ..	500	285	166 KW.	£31,721	332 KW.		2 arc, 38 m
268	LOWESTOFT	Lowestoft Corporation ..	1901	G. A. Bruce ..	230 & 460	Direct ..	1,475	863	..	£81,963	1,190 KW.		81 arc, 361 i
269	LUDLOW	Ludlow Electric Light Co., Ltd.	1907	Edwards and Armstrong	230	Direct ..	75	30	57.5 KW.	£4,020	70 KW.		2 mtl.
270	LUTON	Luton Corporation	1901	W. H. Cooke ..	250 & 500	Direct ..	647	353	120 KW.	£36,679	623 KW...		10 arc, 24 in 3 Nernst
271	LYME REGIS	Lyme Regis Electric Light & Power Co.	1909 (June 1)	.. .. ..	110	Direct ..	50	..	38.5 KW.	£3,500	31 KW.		122 mtl.
272	LYMINGTON	Lymington Electric Light & Power Co., Ltd.	1900	Glynn Salter ..	240	Direct ..	150	102	55 KW.	£36,348	436.5 KW.		67 mtl., 47 N
273	LYNTON & LYNMOUTH	Lynton & Lynmouth Electric Light Co., Ltd.	1890	P. T. Kimmins	100	100~, 1-ph.	175	89.5	..	£8,000	160 KW.		90 cbn., 12 m
274	MACROOM	Macroom Electric Light Co.*	1899	D. E. McDonnell	230	100~, 1-ph.	150	47	..	..	67 KW.		87 inc.
275	MAIDENHEAD	Maidenhead Corporation ..	1902	C. O. Milton ..	230 & 430	Direct ..	406	275	100 KW.	£42,000	677 KW...		55 arc, 104 N 50 mtl.
276	MAIDSTONE	Maidstone Corporation ..	1901	E. E. Hoadley ..	2 0 & 460, tr. 500	Direct ..	1,250	827	188 KW.	£74,000	920 KW.		71 arc., 25 cbn 153 mtl., 210
277	MALTON & NORTON	Northern Counties Electricity Supply Co., Ltd.	1904	J. Chandler (Res.)*	230 & 460	Direct ..	80	93	..	..	164 KW.		..
278	MALVERN	Malvern Urban District Council	1904	W. J. Rendell Baker	100 & 200	50~, 1-ph.	250	110	..	£21,000	477 KW.		.. ..
279	MANCHESTER	Manchester Corporation ..	1893	S. L. Pearce ..	100, 200, & 400 D.C.*	Direct, and 50~, 3-ph.*	33,800	25,180	480 KW.	£2,338,378	20,988 KW.		41 arc ..
280	MANSFIELD	Mansfield Corporation ..	1908	E. Holcombe Hewlett	240 & 480 tr. 550-600	Direct ..	720	305 lg. 500 tr.	280 KW. (1 hour)	£71,656*	555 KW.		40 arc, 1 Nernst
281	MARDY (CLAM.) ..	Mardy Electric Light Co., Ltd.	1898	W. W. Ross ..	220*	Direct ..	60	49	12 KW.	£3,000	133 KW.		2 arc, 60 mt
282	MARGATE & BROADSTAIRS & S. PETERS	Isle of Thanet Electric Tramways & Lighting Co., Ltd.	1908	J. A. Forde ..	240 & 480, tr. 500-550	Direct ..	1,100	950	60 KW.	..	290 KW.		22 arc
283	MARKET DRAYTON ..	Market Drayton Electric Light & Power Co., Ltd.	1903	C. F. Bottomley	240 & 480	Direct ..	90	66.5	43.2 KW.	£15,862 (1907)	234 KW.		..
284	MELROSE	Electric Supply Corporation, Ltd.	1904	K. A. Scott-Moncrieff*	225 & 450	Direct ..	66	24	35 KW.	£10,300	68.7 KW.		2 cbn., 44 N
285	MELTON MOWBRAY ..	Melton Mowbray Electric Light Co., Ltd.	1900	J. E. Edmundson	240 & 480	Direct ..	300	163	86 KW.	£40,008	400 KW.		8 arc, 158 cbn 14 N.
286	MERTHYR TYDFIL ..	Merthyr Electric Traction and Lighting Co., Ltd.	1901	L. W. Dixon ..	230 & 460	Direct ..	820	lg. 271, tr. 297	380 A.H.	£47,028	514 KW...		14 arc
287	MEVAGISSEY	Mevagissey Electric Supply Co., Ltd.	1896	R. F. Browne ..	110	Direct ..	40	8.12	11.6 KW.	£1,600	20.2 KW.		57 mtl.
288	MEXBOROUGH	Mexborough Urban District Council	1902	John Senior ..	220 & 440	Direct ..	300	220	50 KW.	£20,640	378 KW.		15 arc, 256 cb
289	MIDDLESBROUGH ..	Middlesbrough Corporation ..	1901	Horace M. Taylor	230 & 440	Direct ..	1,600	1,238	176 KW.	£107,000	2,027 KW.		..
290	MIDDLETON	Middleton Corporation ..	1902	S. Pauls	220 & 440 tr. 500	Direct ..	768	700	44 KW.	£40,255	285 KW.		18 arc, 36 cbn
291	MILFORD-ON-SEA ..	Milford-on-Sea Electric Supply Co., Ltd.	1906	L. Nicholson ..	230 & 460	Direct ..	100	..	240 A.H.	£8,000	..		..
292	MINEHEAD	Minehead Electric Supply Co. Ltd.	1903	B. W. Gothard ..	220	Direct ..	141	91	14 KW.	£15,000	175 KW.		4 arc, 34 cbn
293	MIRFIELD	Mirfield Urban District Council	1905	John Lomas ..	100 & 200	50~, 1-ph.	..	85	..	£4,250	..		56 mtl.
294	MONMOUTH	Monmouth Corporation ..	1899	F. Windsor ..	100 & 200	60~, 1-ph.	123	72.4	..	£17,906	136 KW...		496 cbn., 4 mtl.
295	MONTROSE	North of Scotland Electric Light & Power Co., Ltd.	1901	F. Barritt Hills	240 & 480	Direct ..	282	151	43	£40,262	472 KW.		20 arc, 82 cbn 243 mtl.
296	MORECAMBE	Morecambe Corporation ..	1898	W. H. Hall ..	220	Direct ..	700	335	290 KW.-hrs.	£62,598	446 KW...		104 arc, 27 inc., 3 N.
297	MORLEY	Morley Corporation	1898	J. E. Ellis ..	100 & 200	60~, 1-ph.	240	180	..	£29,500	..		15 arc, 34 m
298	MORPETH	Northern Counties Electricity Supply Co., Ltd.	1904	W.H. Bibby (Res.)*	230 & 460	Direct ..	60	48	..	..	142 KW.		..
299	MOTHERWELL	Motherwell Corporation ..	1901	S. Williams ..	230 & 460	Direct ..	1,410	643	100 KW.	£66,904	765.5 KW.		60 arc, 597 in 62 Nernst
300	MUSSELBURCH ..	Musselburgh & District Elec. Light & Traction Co., Ltd.	1904	A. A. Watkins ..	230 & 460, tr. 500	Direct ..	600	200 lg. 200 tr.	96 KW. lg. 200 KW. tr.	£135,330	280 KW.		20 arc
301	NELSON	Nelson Corporation	1892	D. Helme ..	240 & 460	Direct ..	1,000	745	..	£74,167	1,058 KW.		..
302	NEWBURY	Urban Electric Supply Co., Ltd.	1905	Herbert W. Bush	240 & 480	Direct ..	497	210	133 KW.	£49,617	389 KW.		..
303	NEWCASTLE-ON-TYNE	Newcastle & District Electric Lighting Co., Ltd.	1890	W. D. Hunter ..	100 A.C.; 240 & 480 D.C.	80~, 1-ph., & direct	9,000	5,050	1,050 KW.	£570,574	..		..
304	NEWCASTLE-ON-TYNE	Newcastle Corporation ..	1901	Ernest Hatton ..	240 & 480 tr. 550	Direct ..	5,150	3,300	1,200 KW.	£1,169,603	174.5 KW.		413 arc, 3 Nernst
305	NEWCASTLE-ON-TYNE AND TYNESIDE	Newcastle-on-Tyne Electric Supply Co., Ltd.	1890	R. P. Sloan (Man.) J.S.Watson(Tech)	240 & 480D.C. 440 A.C*	40~, 3-ph., and direct	47,000	37,400	1,440 KW.	£1,785,980 exc. arc lg.	6,531 KW.		8 arc, 390 cbn 9 × 2 N.
306	NEWCASTLE-UNDER-LYME	Newcastle-under-Lyme Corporation	1904	A. J. C. de Renzi	230	Direct ..	140	63	82 KW.	£8,500	146 KW. ..		..
307	NEWMARKET AND EXNING	Newmarket Electric Light Co. Ltd.	1899	F. A. Simpson ..	210 & 420	Direct ..	500	303	54 KW.	£41,957	750 KW.		12 arc
308	NEWPORT & COWES	Isle of Wight Electric Light & Power Co., Ltd.	1901 and 1903	A. E. Mayes (Asst. H. Banks)	240 & 480	Direct ..	380	280	Nt. 48 KW. Cs.144 KW.	£84,049	855 KW.		60 arc, 60 cbn 5 N.
309	NEWPORT (MON.) ..	Newport Corporation	1895	H. Collings Bishop	100 & 200 A.C. 230 D.C.	87.5~, 1-ph. & direct	3,050*	1,870*	164 KW. for 10 hrs.	£266,124	2,807 KW.		177 arc, 28 mtl., 110 N.
310	NEWQUAY	Newquay Electric Light & Power Co., Ltd.	1906	A. S. Hawkins ..	230 & 460	Direct ..	160	92	35 KW.	£14,000	167 KW.		10 cbn ,200 mt
311	NEWTON ABBOT ..	Urban Electric Supply Co., Ltd.	1903	G. E. Smith ..	240 & 480	Direct ..	180	148	168 KW.	£42,976	299.9 KW.		24 arc, 1 cbn. 612 mtl.
312	NORTHALLERTON ..	Northallerton Electric Light & Power Co., Ltd.	1899	F. R. Batty ..	220	Direct ..	150	100	32.7 KW.	£7,773 (wrtn. dn.)	132.5 KW.		31 arc, 70 inc
313	NORTHAMPTON ..	Northampton Electric Light & Power Co., Ltd.	1891	G. H. Jackson ..	210 & 420	Direct ..	1,440	891	35 KW.	£120,115	1,601 KW.		..
314	NORTHWICH	Northwich Electric Supply Co., Ltd.	1897	W. Boyd ..	220 & 440	Direct ..	415	179	229 KW.	£34,738	580.6 KW.		57 cbn., 4 mtl
315	NORWICH	Norwich Corporation	1893	F. M. Long ..	220 & 440	Direct ..	3,504	2,850	300 KW.	£299,306	4,228 KW.		20 arc
316	NOTTINGHAM	Nottingham Corporation ..	1894	H. Talbot ..	200 & 400	Direct ..	10,043	6,385	100 KW.	£458,502	..		92 arc
317	NUNEATON	Nuneaton Corporation ..	1900	S. C. Gibson ..	220 & 440	Direct ..	600	329	40 KW.	£33,000 (approx.)	712 KW.		20 arc, 2 cbn. 90 mtl.
318	OBAN	Oban Corporation	1903	Malcolm Sutherland	230 & 460	Direct ..	240	116	72 KW.	£22,007	251 KW.		33 arc, 64 cbn. 122 mtl.
319	OGMORE VALLEY ..	Ogmore Valley Electric Light & Power Supply Co., Ltd.	1891	A. E. Marks ..	210 to 220	40~, 1-ph., & direct	300	150	..	£8,958	120 KW.		210 inc.
320	OLDHAM	Oldham Corporation	1894	S. W. Newington	210 & 420 tr. 500	Direct ..	5,233	2,400	..	£276,168	..		20 arc
321	OSWESTRY	Oswestry Electric Light and Power Co., Ltd.	1896	E. B. Smith ..	230	Direct ..	225	123	6.6 KW.	£12,680	173 KW.		..
322	OULTON BROAD ..	Oulton Broad Electricity Co...	1902	B. Barber ..	230	Direct ..	45	18	14 KW.	£3,200	88.5 KW.		32 inc.
323	OXFORD	Oxford Electric Co., Ltd. ..	1892	F. H. Francis ..	100	Direct, & 50~, 3-ph.	1,550	1,206	90 KW.	£190,593	2,880 KW.		32 arc, 48 cbn
324	PAIGNTON	Paignton Electric Light and Power Co., Ltd.	1908*	C. D'A. Jackson	220 & 440	Direct ..	60	12	58 KW.	£3,343	11.5 KW.		14 arc, 4 mtl
325	PAISLEY	Paisley Corporation	1899	C. F. Parkinson ..	200 A.C. tr. 500 D.C.	50~, 1, 2 & 3-ph., & direct	2,400 lg. 1,800 tr.	781 lg. 921 tr.	..	£179,000	2,208 KW.		94 arc
326	PARTICK	Partick Corporation	1902	W. Sillery ..	240 & 480	Direct ..	1,450	1,122	150 KW.	£120,000	1,212 KW.		301 arc, 304 mtl.
327	PEMBERTON	Wigan Corporation	1902	James Slevin ..	230 tr. 460	Direct ..	900	190 lg. 385 tr.	75 KW.	£47,691	232 KW.		12 arc, 20 cbn 8 mtl., 180 N
328	PEMBROKE (DUBLIN) ..	Pembroke Urban District Council	1900	S. L. R. Price ..	220 & 440	Direct ..	600	304	192 KW. for 2½ hrs.	£70,500	664 KW.		87 arc, 162 cbn 26 mtl.
329	PENARTH	Penarth Electric Lighting Co., Ltd.	1901	H. Cameron ..	230, 460 & 500	Direct ..	530	283.5	40 KW.	..	681 KW.		108 mtl. ..
330	PENRITH	Penrith Electric Supply Co., Ltd.	1909 (June 4)	J. Lakin Rogers	110 & 220	Direct ..	100	20	4.4 KW.	£7,000	20 KW.		..
331	PERTH	Perth Corporation	1901	J. Lambert ..	230 & 460	Direct ..	1,175	688	276 KW.	£58,271	1,041 KW.		84 arc, 35 mtl
332	PETERBOROUCH ..	Peterborough Corporation ..	1900	J. C. Gill ..	200 & 400	Direct ..	840	508	72 KW. lg. 72 KW. tr.	£54,317	701 KW.		119 arc, 4 cbn 45 mtl.
333	PLYMOUTH	Plymouth Corporation ..	1899	E. G. Okell ..	100 & 200 tr. 500 D.C.	50~, 1-ph. D.C. for tr.	2,800	1,480	237 KW. for 5 hrs.	£155,340	2,250 KW.		80 arc ..
334	PONTYPOOL	Pontypool Electric Light & Power Co., Ltd.	1898	W. J. Maybery ..	103	Direct ..	169	116	25 KW.	£11,412	258 KW.		15 arc, 20 cbn., 4 mtl., 20 N.
335	PONTYPRIDD	Pontypridd Urban District Council	1905	J. E. Teasdel ..	230 & 460	Direct ..	900	555	495 KW.	£55,000	502 KW.		40 arc ..
336	PORTPATRICK ..	Portpatrick Electric Supply Co., Ltd.	1904	..	200 & 400	Direct ..	50	..	..	..	..		..
337	PORTSMOUTH	Portsmouth Corporation ..	1894	W. S. Foale ..	100	50~, 1-ph.	3,336	2,680	100 KW.	£302,000 (Mar. 1907)	6,216 KW.		328 arc,* 464 inc.
338	PRESCOT & DISTRICT	British Insulated & Helsby Cables, Ltd.	1891	R. P. Nash ..	100 A.C., 250 & 550 D.C.	100~, 1-ph. & direct	1,760	1,350	..	£69,000	401 KW.		23 arc, 144 cbn. 193 mtl.
339	PRESTON	National Electric Supply Co., Ltd.	1892	J. H. Tonge ..	220 A.C., 220 & 440 D.C.	50~, 1-ph., & direct	2,630	1,359	88 KW.	£185,842	3,209 KW.		64 arc ..
340	PUDSEY	Pudsey Corporation	1905	Edward Denton	230 & 460	Direct ..	110	25	..	£5,477	64 KW.		20 mtl. ..
341	QUEENSTOWN	Cork Electric Tramways & Lighting Co., Ltd.	1900	W. H. Joyce ..	230 & 460	Direct ..	230	106	270 A.H.	£27,388	192 KW.		15 arc, 24 cbn.
342	RADCLIFFE	Radcliffe Urban District Council	1904	H. Wilkinson ..	220 & 440 tr. 525	Direct ..	490	490	88 KW.	£25,550	182 KW.		15 arc, 1 mtl.
343	RAMSGATE	Ramsgate and District Electric Supply Co., Ltd.	1905	M. Farrer ..	240 & 480	Direct ..	290	155	150 KW.	£37,164	399 KW.		..

		4 mtl.					htg. 1	& sliding scale		31, 1909	
5,480	133 KW.	..	..	..	161 KW. ..	..	Lg. 5½	Flat rate	..	.. ..	264
3864	463 KW.	2 arc, 290 inc., 92 Nernst	57=140 H.P.	..	628 KW.	..	Lg. 3½ to 2; pb. lg. 2; pr. 2½ to ¾	Flat rate & scale ..	..	.. ..	265
5,191	324 KW. ..	..	58=151 H.P.	..	437 KW.	16	Lg. 8 & 2, or 6; pr. 2½ to 1½ (all less 5%)	Max. demand, flat rate & sl. scl. w. dis.	188,573	Data to Mar. 31, 1908	266
5,721	352 KW.	2 arc, 38 mtl.	68=382 H.P.	..	656 KW. ..	6.3	Lg. 4 (factories 3); pb. lg. 2½; pr. 1	Flat rate	266,372	Data to Mar. 31, 1909	267
5,963	1,190 KW.	81 arc, 361 inc.	81=457 H.P.	40=1,000 H.P.	2,328 KW.	..	Lg. 4½; pb. lg. 3; pr. 2 & 1½; tr. 2	Flat rate	1,049,402	Lighting & traction. Data to Sept 30, 1908	268
6,020	70 KW.	2 mtl. ..	6=5⅞ H.P. ..	..	76 KW.	..	Lg. 7 with discounts; pb. lg. 4; pr. 4 & 2	Flat rate with discounts	18,100	Data to Dec. 1908	269
6,679	623 KW...	10 arc, 24 inc., 3 Nernst	114=545 H.P.	..	1,142 KW.	..	Lg. 6 & 2, or 4; pb. lg. 2; pr. 2, 1½ & 1	Max. demand, flat rate & sl. scale	..	.. ..	270
6,500	31 KW.	122 mtl. ..	2=3 H.P. ..	..	40 KW.	..	Lg. 6; pb. lg. contract; pr. 6 ..	Flat rate & contract	..	.. ..	271
6,348	436.5 KW.	67 mtl., 47 N.	24=78 H.P.	..	559.6 KW.	..	Lg. 7 & 4, or 2½; pb.lg. £2¾ & £2¾ p.a.; pr. 4 & 1½, or 2½	Max. demand & flat rate	121,400	Data to Dec. 31, 1908	272
7,000	160 KW.	90 cbn., 12 mtl.	4=15 H.P. ..	..	187 KW. ..	..	Lg. 5; pb. lg. inc. £2½ p.a.; pr. 2½	Flat rate, 2-rate mtr. and contract	191,799	Part water power. Data to Mar. 25, 1908	273
	67 KW.	87 inc. ..	..	..	77.5 KW.	..	Lg. 4½, or 1s. per c.p. p.a.; pb. lg. total £180 p.a.	Flat rate and contract	..	Part water power. *T. Smith, Astley, proprietor. ..	274
7,000	677 KW...	55 arc, 104 N., 50 mtl.	33=125 H.P.	..	767 KW.	..	Lg. 5; pb. lg. arc £18½ to £10, inc. £3 p.a.; pr. 2 to 1½	Flat rate and max. demand	..	.. ..	275
7,000	920 KW.	71 arc., 25 cbn., 153 mtl., 210 N.	1,196 H.P. ..	40=1,000 H.P.	1,888 KW.	13	Lg. 7 & 2, or 4; pb. lg. 1 4; pr. 2 to 1; htg. 1; tr. 1.5	Max.dem.& flat rate; sl. sc. for pr.	1,513,381	Lighting and traction. Data to Mar. 31, 1909	276
	164 KW.	..	66 KW. ..	..	230 KW.	..	Lg. 4½; pr. 2½ to 1½	Flat rate & sliding scale	..	Norton supplied from Malton. *C.W. Fairweather (Mgr.). Cons. engrs. Merz & McLellan. Data to Dec. 31, 1908	277
7,000	477 KW.	.. ..	18=36.5 H.P.	..	506 KW. ..	22.1	Lg. 6, first 2½ units per 8-c.p. per qr., all above, 4; pr. 3	Special scale and flat rate	114,153	Data to Mar. 31, 1909	278
7,373	20,988 KW.	41 arc ..	2,805=17,462 H.P.	See other Table	34,507 KW. (ex. tr.)	..	Lg. 4½ & 1½; pb. lg. 2; pr. 1½ to 1; tr. 1½ approx.	Max. demand and sliding scale	47,564,903	Lighting and traction, three stations. *A.C. 6,500 volts.	279
7,656*	555 KW.	40 arc, 12 Nernst	76=242 H.P.	42=1,306 H.P.	1,969 KW.	3.9	Lg. 7 & 1 pr. 4 & 1 (day 1); tr. 1½ to 1	Max. demand and 2-rate meters	1,068,354	Lg. & tr. Comparative decrease in output due to metal lamps. *Incl. destructor, £13,400. Data to Mar. 31, '09	280
7,000	133 KW.	2 arc, 60 mtl.	5=10 H.P.	..	163 KW.	..	Lg. 4½; pb. lg. arc £12½, mtl. £3½ p.a.	Flat rate	60,000	Overhead mains. *Private lg. 220 volts 2-wire; public lg. 110 volts 3-wire	281
	290 KW.	22 arc ..	7=35 KW.	120=3,000 H.P.	768 KW. (ex. tr.)	..	Lg. 5 with discount; pb. lg. 2½; pr. 3 with di count	Flat rate with discounts	1,500,000	Lighting and traction station. Data to Sept. 30, 1908	282
7,862	234 KW.	..	25=90 H.P.	..	326 KW. ..	..	Lg. 7 & 4; pr. 2½	Max. demand & flat rate	57,222	Data for 1908	283
(1907) 8,300	68.7 KW.	2 cbn., 44 N.	9=28 H.P.	..	96.6 KW.	8.2	Lg. 6; pb. lg. 3; pr. 3; htg. 1½	Flat rate	21,562	*Resident engineer S. Johnston. Gas power. Data for 1908	284
8,008	400 KW.	8 arc, 158 cbn., 14 N.	48=197½ H.P.	..	600 KW. ..	4	Lg. 5½; pb. lg. £325 p.a.; pr. 4 & 1½, or 2½	Lg. flat & contract; pr. m.d. & flat	228,360	Data to Dec. 31, 1908	285
8,028	514 KW...	14 arc ..	100½ H.P.	30=990 H.P.	1,604 KW.	..	Lg. 7 & 2*; pb. lg. £16.8 p.a.; pr. 4½ & 1½; tr. 1½	Max. demand* and flat rate	642,735	Lighting and traction. *Max. average, 3⅞d. Data to Dec. 31, 1907	286
8,600	20.2 KW.	57 mtl. ..	..	..	22.2 KW.	10	Lg. 6; pb. lg. contract	Flat rate and contract	9,700	Data to April, 1909	287
8,640	378 KW.	15 arc, 256 cbn.	20=64 H.P.	..	470 KW.	12	Lg. 3, 3½, 4; pb. lg. 2.08; pr. 1½; 2, 2½	Flat rates	306,327	Data to Mar. 31, 1909	288
9,000	2,027 KW.	..	1,460 H.P.	..	3,120 KW.	..	Lg. 6 & 2, or 4; pr. 2 & 1	Max. demand & flat rate	1,663,090	Motors on hire-purchase system. Data to Mar. 31, 1909	289
9,255	235 KW.	18 arc, 36 cbn.	67=450 H.P.	See other Table	360·5 KW. (ex. tr.)	..	Lg. 4 to 3; pb. lg. 3; pr. 2 to 1 less 5%; tr. 1½ to 1	Flat rate and sliding scale	..	Lighting and traction; local Tramway Co. and Manchester Corporation supplied. Data to Mar. 31, 1908	290
9,060	..	..	..	..	..	..	.. ..	.. ..	..	Suction gas plant	291
9,000	175 KW.	4 arc, 34 cbn.,	18=33 H.P.	..	280 KW. ..	20	Lg. 5; pb. lg. 3; pr. 2	Flat rate	76,178	Gas power. Data to Dec. 31, 1908	292
9,250	..	56 mtl. ..	8=24½ H.P.*	..	134.4 KW.	25	Lg. 4½; pb. lg. 1; pr. 2 & 1 ..	Flat rate, & sliding scale with dis.	33,659	*Fans and radiators, 8 H.P. Data to Mar. 31, 1909 ..	293
9,906	136 KW...	496 cbn., 41 mtl.	10=40 H.P.	..	208 KW.	6.2	Lg. 5½; pb. lg. 2.1; pr. 3; tr. 2	Flat rate .. .	144,282	Water power. Data to Mar. 29, 1908	294
9,262	472 KW.	20 arc, 82 cbn., 243 mtl.	61=209 H.P.	..	676 KW.	5.1	Lg. 6 & 4, or 5½; pb. lg. 2.3; pr. 4 (peak) & 1½, or 2½	Max. dem., flat, 2-rate meter, & contract	174,960	Data to Dec. 31, 1908	295
9,593	446 KW...	104 arc, 275 inc., 3 N.	22=93 H.P...	..	633 KW.	..	Lg. 6 & 5; pb. lg. arc 1s. 3d. per night, inc. 4½d. p. u.; pr. 3	Flat rate	204,145	.. ..	296
9,500	..	15 arc, 34 mtl.	31=103 H.P.	..	512 KW. ..	..	Lg. 4 w. dis. to 25%; pb. lg. arc £22 p.a.; pr. 2½ to ⅝	Flat rate with discounts	191,601	Output decreased owing to almost universal use of metallic-filament lamps in this town. Data to Mar. 31, 1909	297
	142 KW.	..	73 KW. ..	..	215 KW.	..	Lg. 4; pr. 2½ to 1½	Flat rate & sliding scale	..	*C. W. Fairweather (Mgr.) Cons. engrs. Merz & McLellan. Data to Dec. 31, 1908	298
9,904	765.5 KW.	60 arc, 597 inc., 62 Nernst	163=1,488 H.P.	..	2,033 KW.	..	Lg. 3½; pb. lg. arc £15, inc. £3½ & £2, N. £3½ p.a.; pr. 2 to ⅜	Flat rate and sliding scale	..	.. ..	299
9,330	280 KW.	20 arc ..	21=135 H.P.	28=700 H.P.	960 KW. ..	8.8	Lg. 6 & 1½, or 4; pb. lg. 2½; pr. 3 & 1½; tr. 1½	Max. demand, flat rate & contract	498,848	Lighting and traction. Lighting output reduced by use of metallic filament lamps. Data to Dec 31, 1908	300
9,167	1,053 KW.	..	302 H.P. ..	20=500 H.P.	..	..	Lg. 4 to 3; pr. 2½ to 1½ less 5%; tr. 2	Sliding scale ..	889,573	Lighting and traction. Data to Mar. 31, 1909	301
9,617	389 KW.	..	45=193 H.P.	..	563 KW. ..	13.1	Lg. 7 & 3, or 6; pr. 2½ & 1 ..	Max. demand, flat rate & contract	212,169	Gas and water power. Data to Dec. 31, 1908	302
9,574	..	..	..	..	18,780 KW.	8	Lg. 3½ net; pr. 1½ max... ..	Flat rate, sliding scale, & contract	9,182,095	Large power load. Data to Dec. 31, 1908	303
9,603 (inc lg.	174.5 KW.	413 arc, 37 Nernst	14=119 H.P.	418=12,450 H.P.	..	..	Lg. 2 to 2½; pr. 1½	Flat rate & sliding scale	121,934	Lighting and traction. Light and power supplied to public buildings only. Data to Mar. 31, 1909	304
9,980	6,531 KW.	8 arc, 390 cbn., 9 × 2 N.	22,686 KW. Htg. 736 KW.	Tr. 12,170 KW. Blk. 41,009 KW.	83,167 KW.	19.5	Lg. 3⅜ less 5%; pb. lg. arc £20, inc. £2,15 6 p.a.; pr. 1½ w. dis.	Flat rate w. dis., time sw., cont. & special	..	Lg. & tr. Cons. engs., Merz & McLellan (see other table Power Cos.). *Tr. 500 & 600 v. Data to Dec. 31, 1908	305
9,500	146 KW. ..	..	2=4 H.P. ..	..	149·5 KW.	12	Lg. 6; pr. 3	Flat rate	45,608	Gas power; town gas at 2s. 8d. per 1,000 cubic ft. Data to Mar. 31, 1908	306
9,957	750 KW.	12 arc ..	15=57 H.P.	..	785 KW.	4.2	Lg. 7 & 4, or 6; pb. lg arc £8½ p. a.; pr. 4 & 1½	Max. demand and flat rate	158,349	Data to Dec. 31, 1908	307
10,049	855 KW.	60 arc, 60 cbn., 5 N.	62=200 KW.	..	1,140 KW.	9	Lg. 7 & 4, or 6; pr. 4 & 1½, or 2½	Max. demand and flat rate	342,546	Supply from N. to C. at 2,500 volts D.C. Data to Dec., 1908	308
10,124	2,807 KW.	177 arc, 28 mtl., 110 N.	118=1732 H.P.	82=1,560 H.P.	5,920 KW.	..	Lg. 4 & 3; pb. lg. arc £16, N. £2⅞ p.a.; pr. 2 to 1; htg. 1; tr. 1.35	Flat w. dis., sl. sc., 2-rate meter & time sw.	3,578,690	Lighting and traction. *Two gen. stns.; energy sold to tramways Data to Mar. 31, 1908	309
10,000	167 KW.	10 cbn ,200 mtl.	1=26 H.P. ..	..	179·5 KW.	..	Lg. 6; pr. 3	Flat rate & contract	..	.. ..	310
10,976	299.9 KW.	24 arc, 1 cbn. 612 mtl.	26=154½ H.P.	..	498 KW. ..	6	Lg. 7 & 3, or 6; pb. lg. contract; pr. 4 & 1½, or 2½	Max. demand, flat rate and contract	244,179	.. ..	311
10,773 (inc dn.)	132.5 KW.	31 arc, 70 inc.	33=98 H.P.	..	236 KW.	..	Lg. 6; pb. lg. arc 13/-, inc. 3/9 & 3/-, per 1·0 hrs.; pr. 4 to 1½	Flat rate w. dis., sl. scale & contract	95,178	Data to Dec. 31, 1908	312
11,115	1,601 KW.	..	1,093 H.P. ..	..	2,605 KW.	17	Lg. 6 & 3, or 5 (pr. ho. 4½*); pr. 2 to 1; htg. 1½	Max. demand, flat & sl. scale w. dis.*	1,075,423	*Alternative, 12½% per annum on assessment, and 1½ per unit for energy used for dom. pur. Data to Dec. 31, '08	313
11,738	580.6 KW.	57 cbn., 4 mtl.	68=444 H.P.	..	997 KW. ..	..	Lg. 6 & 4; pb. lg. 2.94; pr. 2	Max. demand ..	234,746	A. W. Selater, Cons. eng. Mond gas power	314
11,306	4,228 KW.	20 arc ..	485=2,662 H.P.	..	6,581 KW.	11	Lg. 4½*; pb. lg. 1; pr. 3 to ¾ ..	Flat rate, sliding scale & special*	4,066,869	Purchased from Co. in 1902. *Also 12½% on assessment and 1d. per p.u. Data to Mar. 31, 1909	315
11,502	..	92 arc ..	954=3,820 H.P.	..	12,306 KW. (ex tr.)	..	Lg. 5 & 1½; pb. lg. 5 & 1½; pr. 1½; tr. 1½	Max. demand & flat rate	11,452,806	Lighting and traction. Data to Mar. 31, 1909	316
12,000 (ex.)	712 KW.	20 arc, 2 cbn., 90 m'l.	56=228 H.P.	..	938 KW. ..	10.8	Lg. 5 to 2; pb. lg. arc £8, mtl. £3½ p.a.; pr. 2½ to 1	Flat rate & sliding scale*	341,588	*Alternative tariff based on assessment, with low charge per unit. Data to March 31, 1909	317
12,007	251 KW.	38 arc, 64 cbn., 122 mtl.	18=106 H.P.	..	352 KW. ..	..	Lg. 6; pr. 3	Lg. flat rate, pr. sl. scale, with dis.	129,815	Data to May 15, 1908	318
12,058	120 KW.	210 inc. ..	..	..	200 KW. ..	..	Lg. 3, 4, 4½; pb. lg. contract ..	Sliding scale & contract	..	Data to April 20, 1909	319
12,168	..	20 arc ..	..	See other Table	2,604 KW. (ex. tr.)	..	Lg. 4 & 1½; pb. lg. 2½; pr. 2 to 1; tr. 1½	Max. demand, flat rate & sl. scale	4,133,615	Lighting and traction	320
12,680	173 KW.	..	3=12 H.P. ..	..	183 KW. ..	..	Lg. 7 & 3; pr. 3 (minimum 10/- per H.P.)	Max. demand and flat rate	110,169	Data to Dec. 31, 1908	321
12,200	88.5 KW.	32 inc. ..	1=5 H.P. ..	..	96 KW. ..	..	Lg. 6½; pb. lg. £2½ p.a.; pr. 3..	Flat rate with rebate	22,700	.. ..	322
12,593	2,880 KW.	32 arc, 48 cbn.	83=168 H.P.	..	3,143 KW.	11.5	Lg. 6 w. dis.; pb. lg. 2½; pr. 3 to 2 w. dis.	Flat rate with discount	1,180,143	Data to Dec. 31, 1908	323
12,843	11.5 KW.	14 arc, 4 mtl.	6=4 H.P. ..	..	22.8 KW.	..	Lg 6; pr. 3..	Flat rate with discounts for power	..	*Supply commenced Dec. 25, 1908. Data to May 1, 1909	324
13,000	2,308 KW.	94 arc ..	101=580 H.P.	104=2,600 H.P.	5,048 KW.	10.8	Lg. 4; pb. lg. arc £25 p.a.; pr. 1½ to ⅔; tr. 2 to 1½	Flat rate & sliding scale	2,783,069	Lighting and traction. Data to May 15, 1908	325
13,000	1,212 KW.	301 arc, 304 mtl.	251=2881 H.P.	..	3,686 KW.	..	Lg. 3½, or 6 & 1; pb. lg. 0.9; pr. 1	Flat rate & max. demand	2,650,000 (approx.)	Data estimated to May 15, 1909	326
13,391	232 KW.	12 arc, 20 cbn., 8 mtl., 180 N.	5=71 H.P. ..	24=840 ..	273.5 KW.	..	Lg. 5, 4, 3; pb. lg. 3; pr. 2 to 1; tr. 1.4	Flat rate with disc., & time sw.	744,795	Lighting and traction. Data to Mar. 31, 1908	327
13,500	664 KW.	87 arc, 162 cbn., 26 mtl.	15=81 H.P.	..	777 KW. ..	24	Lg. 4½; pb. lg. arc £20, inc. £3½ & £5½ p.a.; pr. 4½ & 1½; htg. 1½	Flat rate, 2-rate mtr. w. time sw., & cont.	291,088	Data to Dec. 31, 1907	328
	681 KW.	108 mtl. ..	8=44 H.P...	..	726 KW. ..	31	Lg. 7 & 2, or 4½; pb. lg. 5d. per 50 c.p. lp. p.a.; pr. 4½, 1½ & 1	Max. dem., flat rate, & sl. scale	211,043	Data to Dec. 31, 1908	329
14,000	20 KW.	..	..	..	20 KW.	..	Lg. 5; pr. 2½	Flat rate	..	2 Crossley Suction Gas plants	330
14,671	1,041 KW.	84 arc, 35 mtl.	86=270 H.P.	24=840 H.P.	1,823 KW.	..	Lg. 3½ to 2½; pb. lg. 1½; pr. 2 to 1½; tr. 1½	Flat rate	893,652	Lighting and traction. Data to May 15, 1908	331
14,317	701 KW.	119 arc, 4 cbn., 45 mtl.	69=200 H.P.	28=560 H.P.	1,414 KW.	4.2	Lg. 4½ & 4; pb. lg. £13; pr. 1½; tr. 2½ to 1½	Flat rate and sl. scale	605,163	Lighting and traction. Data to Mar. 31, 1909	332
14,340	2,250 KW.	80 arc ..	88=309 KW.	86=1,639 KW.	4,340 KW.	..	Lg. 3⅜ to 2½; pb. lg. arc £21 p.a.; pr. 1½; tr. 1½	Flat rate, w. rebate 12 mt. to 3 p.m.	2,004,154	Lighting and traction. Data for 1906-7	333
14,412	258 KW.	15 arc, 20 cbn., 4 mtl., 20 N.	14=54 H.P.	..	300 KW. ..	4	Lg. 6; pb. lg. 3; pr. 3 & 2 ..	Flat rate	88,564	Data to Dec. 31, 1907	334
15,000	502 KW.	40 arc ..	27=108 H.P.	40=1,480 H.P.	696 KW. ..	100	Lg. 7 & 1, or 3⅜ (sc.); pb. lg. 1½; pr. 1½ & 1; tr. 1½	Max. demand and sliding scale	682,516	Lighting and traction. Data to Mar. 31, 1907	335
	..	..	..	..	..	..	.. ..	.. ..	..	.. ..	336
15,000 (1907) 15,000	6,216 KW.	323 arc,* 464 inc.	262=778 H.P.	..	6,985 KW.	..	Lg. 4½; pb. lg. arc £18 (flame £10), inc. £3 3s. p.a.; pr. 1½	Flat rate & sliding scale	3,294,050	Lighting station only. *265 large arcs, 58 flame arc. Data to Mar. 31, 1908	337
	401 KW.	23 arc, 144 cbn., 193 mtl.	169=2,591 H.P.	8=200 H.P.	3,515 KW.	11	Lg. 4; pb. lg. 2; pr. 1; tr. 1½	Flat rate with dis. & contract	3,491,878	Lighting and traction. Supply to Prescot Dist., S. Lanc. Trys. and B.I. & H.C. works. Data to Dec. 31, 1908	338
15,342	3,300 KW.	64 arc ..	319=1,401 KW. (inc. htg.)	..	4,649 KW.	6.5	Lg. 7 to 4½, less 15%; pb. lg. 1; pr. 1½ to 1 net	Max. demand & sliding scale	1,731,000	Data to Dec. 31, 1908	339
15,177	64 KW.	20 mtl. ..	15=19 H.P.	..	78 KW. ..	40	Lg. 4; pb. lg. 3; pr. 2	Flat rate	26,174	Large consumers supplied by the Yorkshire Electric Power Co. Data to Mar. 31, 1909	340
15,388	192 KW.	15 arc, 24 cbn.	6=34½ H.P.	..	233 KW. ..	2	Lg. 6, 5 & 4½; pb. lg arc £15, inc. £2 5s. p.a., ½ night; pr. 3 & 2½	Flat rate	100,842	Data to Dec. 31, 1908	341
15,550	183 KW.	15 arc, 1 mtl.	40=510 H.P.	See other Table	595 KW.	30	Lg. 4 to 3; pb. lg. 2; pr. 2 to 0.9; tr. 1½	Sliding scale ..	999,787	Lighting and traction. D[illegible]	
15,664	399 KW.	..	41=114 H.P.	..	538 KW. ..	45	Lg. 7 & 3 or 6 (Daylight 15)	[illegible]	[illegible]	Data to Dec. 31, 1907	

					tr. 500 D.C.	ph., & direct	1,800 tr.	921 tr.	..			
326	PARTICK	Partick Corporation	1902	W. Sillery	240 & 480	Direct	1,450	1,122	150 KW.	£120,000	1,212 KW.	301 arc, mtl.
327	PEMBERTON	Wigan Corporation	1902	James Slevin	230 tr. 460	Direct	900	190 lg. 385 tr.	75 KW.	£47,691	232 KW.	12 arc, 20 8 mtl., 1
328	PEMBROKE (DUBLIN)	Pembroke Urban District Council	1900	S. L. R. Price	220 & 440	Direct	600	304	192 KW. for 2½ hrs.	£70,500	664 KW.	87 arc, 162 26 mt
329	PENARTH	Penarth Electric Lighting Co., Ltd.	1901	H. Cameron	230, 460 & 500	Direct	530	283.5	40 KW.	..	681 KW.	108 mtl.
330	PENRITH	Penrith Electric Supply Co., Ltd.	1909 (June 4)	J. Lakin Rogers	110 & 220	Direct	100	20	4.4 KW.	£7,000	20 KW.	..
331	PERTH	Perth Corporation	1901	J. Lambert	230 & 460	Direct	1,175	688	276 KW.	£58,271	1,041 KW.	84 arc, 35
332	PETERBOROUGH	Peterborough Corporation	1900	J. C. Gill	200 & 400	Direct	840	508	72 KW. lg. 72 KW. tr.	£54,817	701 KW.	119 arc, 4 45 mt
333	PLYMOUTH	Plymouth Corporation	1899	E. G. Okell	100 & 200 tr. 500 D.C.	50~, 1-ph. D.C. for tr.	2,800	1,480	237 KW. for 5 hrs.	£155,340	2,250 KW.	80 arc
334	PONTYPOOL	Pontypool Electric Light & Power Co., Ltd.	1893	W. J. Maybery	103	Direct	169	116	25 KW.	£11,412	258 KW.	15 arc, 20 4 mtl., 2
335	PONTYPRIDD	Pontypridd Urban District Council	1905	J. E. Teasdel	230 & 460	Direct	900	555	495 KW.	£55,000	502 KW.	40 arc
336	PORTPATRICK	Portpatrick Electric Supply Co., Ltd.	1904	..	200 & 400	Direct	50	..	..	..	..	..
337	PORTSMOUTH	Portsmouth Corporation	1894	W. S. Foale	100	50~, 1-ph.	3,336	2,680	100 KW.	£302,000 (Mar. 1907)	6,216 KW.	323 arc,* inc.
338	PRESCOT & DISTRICT	British Insulated & Helsby Cables, Ltd.	1891	R. P. Nash	100 A.C., 250 & 550 D.C.	100~, 1-ph. & direct	1,760	1,350	..	£69,000	401 KW.	23 arc, 144 123 mt
339	PRESTON	National Electric Supply Co., Ltd.	1892	J. H. Tonge	220 A.C., 220 & 440 D.C.	50~, 1-ph., & direct	2,630	1,359	88 KW.	£185,842	3,209 KW.	64 arc
340	PUDSEY	Pudsey Corporation	1905	Edward Denton	230 & 460	Direct	110	25	..	£5,477	64 KW.	20 mtl.
341	QUEENSTOWN	Cork Electric Tramways & Lighting Co., Ltd.	1900	W. H. Joyce	230 & 460	Direct	230	106	270 A.H.	£27,288	193 KW.	15 arc, 24
342	RADCLIFFE	Radcliffe Urban District Council	1904	H. Wilkinson	220 & 440 tr. 525	Direct	490	490	88 KW.	£25,550	182 KW.	15 arc, 1
343	RAMSCATE	Ramsgate and District Electric Supply Co., Ltd.	1905	M. Farrer	240 & 480	Direct	290	155	150 KW.	£37,164	399 KW.	..
344	RATHMINES	Rathmines Urban District Council	1900	G. F. Pilditch	220 & 440	Direct	750	400	400 KW.	£110,637	956 KW.	109 arc, cbn., 30
345	READING	Reading Electric Supply Co., Ltd.	1895	E. Rowley Hill	200 & 400 D.C. 200 A.C.	Direct, & 67~, 1-ph.	2,150	1,818	200 KW.	£167,779	2,290 KW.	..
346	REDDITCH	Redditch Urban District Council	1899	W. J. Ferguson	200	66~, 1-ph.	544	350	..	£36,739	292.4 KW.	320 inc.
347	REIGATE	Reigate Corporation	1901	W. S. Ross	200	50~, 1-ph.	480	246	..	£45,000	739 KW.	4 arc, 2 m
348	RHYL	Rhyl Urban District Council	1901	E. H. Wright	230	Direct	495	221	32 KW.	£26,990	375 KW.	58 arc, 8
349	RICHMOND (SURREY)	Richmond (Surrey) Electric Light & Power Co., Ltd.	1893	L. C. B. Trimnell	220 & 440	Direct	1,150	591	55 KW.	£134,454	2,105 KW.	..
350	ROCHDALE	Rochdale Corporation	1903	C. C. Atchison	220 & 440, tr. 500	Direct*	2,476	613 lg. 1,283 tr.	180 A.H.	£95,849	1,365 KW.	..
351	ROSS	Ross Electric Light & Power Co., Ltd.	1902	Chas. E. Gray	230	Direct	100	40.6	50 KW.	£5,758	100 KW.	8 mtl.
352	ROTHERHAM	Rotherham Corporation	1901	Edward Cross	230 & 460, tr. 540	Direct	1,653*	884	46 KW.	£54,574	1,335 KW.	..
353	ROTHESAY	Rothesay Corporation	1899	E. B. Stiven	230 & 430	Direct	34	24	..	£3,000	..	36 arc, 34
354	ROTTINGDEAN	New Rottingdean Electricity Co., Ltd.	1895	J. W. Brown	100	Direct	43	..	..	..	33 KW.	16 inc.
355	ROUNDHAY	Roundhay & District Electric Lighting Co., Ltd.	1908	H. Fox	230 & 460	Direct	160	134	600 A.H.	£15,000	3,255 KW.	30 Nernst
356	RUGBY	Rugby Urban District Council	1908	Thos. S. Shenton	220	50~, 3-ph.	210	200	..	£13,388	465 KW.	..
357	RUGBY SCHOOL	Rugby School Electric Lighting Co., Ltd.	1893	A. E. Lee	103	100~, 1-ph.	85	60	..	£4,500	167 KW.	..
358	RYDE & ST. HELENS	Isle of Wight Elec. Lt. & Pr. Co., & St. Helens El. Lg. Co.	1903	A. E. Mayes (Ass. H. Groome)	240 & 480	Direct, & 50~, 1-ph.	350	160	144 KW.	£62,604	560 KW.	96 mtl.
359	ST. ALBANS	North Metropolitan Electrical Power Distribution Co., Ltd.	1908	E. T. R. Murray (Eng. in chief.*)	230 & 460	Direct	300	50	132 KW.	£11,574	162.5 KW.	..
360	ST. ANDREWS	Electric Supply Corporation, Ltd.	1905	K. A. Scott-Moncrieff*	225 & 450	Direct	300	74	80 KW.	£23,900	312.9 KW.	4 arc, 8
361	ST. ANNES-ON-SEA	St. Annes-on-Sea Urban District Council	1901	J. H. Clothier	240, tr. 500	Direct	750	305 tr., 317 lg.	13 KW.	£48,000	1,034 KW.	44 arc, 31 96 mtl., 17
362	ST. AUSTELL	St. Austell & District Electric Lighting & Power Co., Ltd.	1886	T. Hill	110 & 220	Direct	120	62	46 KW.	£8,000	112 KW.	117 Nern
363	ST. HELENS	St. Helens Corporation	1896	E.M.Hollingsworth	230 & 460 tr. 500	Direct	1,340	1,111	510 KW.	£150,000	1,364 KW.	161 Ner
364	SALE	Sale Urban District Council	1903	C. J. Wood	230 & 460	Direct	100	75	80 KW.	£9,600	335 KW.	5 arc, 4 c 180 mt
365	SALFORD	Salford Corporation	1895	Victor A. H. M'Cowen	220, 440 D.C., 200 A.C., tr 500	75~, 1-ph., & direct	7,000	6,120	360 KW.	£602,397	6,070 KW.	117 arc
366	SALISBURY	Salisbury Electric Light & Supply Co., Ltd.	1898	A. B. Randall	210	Direct	600	314	134 KW.	£69,826	876 KW.	19 inc., Nernst
367	SALTBURN	Cleveland Trust, Ltd.	1899	L. R. Taylor	220	Direct	170	79	92 KW.	£14,000	317 KW.	..
368	SCARBOROUGH	Scarborough Electric Supply Co., Ltd.	1893	F. G. Holden	200 A.C. 500 D.C.	80~, 1-ph., & direct	1,945	872	175 KW.	£109,193	1,926 KW.	..
369	SHANKLIN & SANDOWN	Isle of Wight Electric Light & Power Co., Ltd.	1901	A. E. Mayes (Assist. L. Gillett)	240 & 480	Direct	425	218	40 KW.	£56,205	514 KW.	15 arc, 206 236 mtl., 6
370	SHEERNESS AND QUEENBOROUGH	Sheerness & District Elec. Power & Traction Co., Ltd.	1903	G. L. Kirk	220, 440 A.C. 230, 460 D.C.*	Direct, & 50~, 3-ph.	700	346	..	£50,426	382 KW.	..
371	SHEFFIELD	Sheffield Corporation	1894	S. E. Fedden	200 A.C. 230 D.C.	50~, 2-ph, & direct	8,400 two stns.	6,667	..	£950,000 (inc. purch.)	8,234 KW.	60 arc
372	SHILDON	Northern Counties Electricity Supply Co., Ltd.	1905	T. Heron (Res.)*	230 & 460	Direct	120	85	..	..	237 KW.	..
373	SHIPLEY	Shipley Urban District Council	1901	S. D. Schofield	230 & 460 tr. 500	Direct	1,170	694	750 A.	£62,763	516 KW.	41 arc, Nernst
374	SHREWSBURY	Shrewsbury Corporation	1896	C. M. Johnston	210 & 420	Direct	780	388	..	£53,740	800 KW.	51 arc, 360 152 mt
375	SLEAFORD	Sleaford Urban District Council	1902	W. Henry Wilson	220	Direct	180	72	18 KW.	£11,143	112 KW.	16 arc, 108 10 mtl., 4
376	SLOUGH & DATCHET	Slough and Datchet Electric Supply Co., Ltd.	1903	A. E. Farrow	220 & 440	Direct	580	250	88 KW.	£44,886	348 KW.	103 mtl.
377	SMETHWICK	Birmingham & Midland Tramways Joint Committee	1904	S. A. Mahood	250 & 500 D.C. 5,500 A.C.	25~, 3-ph., & direct	2,400	1,200	..	..	79.5 KW.	..
378	SOUTHAMPTON	Southampton Corporation	1891	H. F. Street	200	Direct	2,200	1,470	1,500 KW.	£179,351	1,832 KW.	92 arc, 66 6 Nern
379	SOUTHEND-ON-SEA	Southend Corporation	1902	Robert Birkett	230 & 460, tr. 500	Direct	2,050	1,438	50 KW.	£123,000 (approx.)	..	99 arc, 50 41 mtl., 11
380	SOUTHPORT	Southport Corporation	1894	A. S. Black	100 & 210 A.C. 500 D.C.	50~, 1-ph., & direct	2,350	1,673	400 KW.	£197,029	3,682 KW.	75 arc, 150
381	SOUTH SHIELDS	South Shields Corporation	1893	J. H. Cawthra	110 & 220 tr. 550 D.C.	50~, 1-ph., & direct	2,700	1,776	517 KW.	£177,438	2,155 KW.	94 arc, 48 inc.
382	SPENNYMOOR	Northern Counties Electricity Supply Co., Ltd.	1902	H. Puttick (Res.) C. W. Fairweather	230 & 460 D.C. 440 A.C.	Direct & A.C.	400*	177	..	..	420 KW.	..
383	STAFFORD	Stafford Corporation	1896	H. Pooley	210 & 420	Direct	565	254	330 KW.	£33,063	..	8 arc
384	STALYBRIDGE	Stalybridge, Hyde, Mossley, & Dukinfield Tr. & El. Bd.	1904	Robert Blackmore	230 D.C., 400 A.C., tr. 500	40~, 3-ph., & direct	7,500	4,800	..	£250,000	500 KW.	..
385	STAMFORD	Urban Electric Supply Co., Ltd.	1902	J. E. Edmundson	240 & 480	Direct	380	200	600 A.H.	£50,574	564 KW.	5 arc, 10 d
386	STIRLING	Stirling Corporation	1900	J. W. Papworth	230 & 460	Direct	638	285	80 KW.	£40,150	567 KW.	60 arc, 96 53 mtl., 6
387	STOCKPORT	Stockport Corporation	1898	R. Lomax	230 & 460 tr. 500	Direct	2,050	1,440	200 KW.	£51,000	892 KW.	49 arc, 2 1 Nern
388	STOCKTON-ON-TEES	Stockton-on-Tees Corporation	1900	J. J. Smith	230 & 460	Direct	1,050	569	75 KW.	£53,926 (approx.)	870 KW.	44 arc
389	STOKE-UPON-TRENT	Stoke-upon-Trent Corporation	1904	P. J. S. Tiddeman	240 & 480	Direct	900	274	50 KW.	£35,044	577 KW.	..
390	STOWMARKET	Suffolk Electricity Supply Co., Ltd.	1896	Napier Prentice	100	Direct	78	42	50 KW.	..	100 KW.	..
391	STRATFORD-ON-AVON	Stratford-on-Avon Electricity Co., Ltd.	1907	Cecil D. Falcke	220 & 440	Direct	100	76.5	33 KW.	£9,984	121 KW.	..
392	STRETFORD	Stretford Urban District Council	1903	R. Rowland	220 & 440, tr. 550	Direct	1,500	988	200 KW.	£76,940	618.4 KW.	98 arc, 1 mtl.
393	SUNDERLAND	Sunderland Corporation	1895	A. S. Blackman	220 D.C.* 220 & 240 A.C.	Direct, & 50~, 3-ph.	9,593	4,082	About 320 KW.	£419,748	2,940 KW.	215 arc, 16 27 mtl., 18
394	SURBITON	Surbiton Urban District Council*	1908	H. MacDonald Gill (resident)	240 & 480	Direct	380	215	90 KW.	£57,640	954 KW.	2 Nernst
395	SUTTON, CARSHALTON WALLINGTN & CHEAM	South Metropolitan Electric Tramways & Lighting Co.	1902	C. W. Durnford (Chf. Eng.)*	200 A.C., tr. 500 D.C.	50~, 1-ph., & direct	1,500	500	..	£80,538	954 KW.	2 arc, 193 2 Nerns
396	SUTTON COLDFIELD	Sutton Coldfield Corporation	1901	T. Duesbury	230 & 460	Direct	625	283	90 KW.	£42,235	745 KW.	14 arc, mtl.
397	SWANSEA	Swansea Corporation	1901	C. A. L. Prusmann	220 & 440 tr. 550	Direct and 50~, 1-ph.	2,325	1,367	78 KW.	£153,240	2,274 KW.	74 arc, mtl.
398	SWINDON	Swindon Corporation	1903	A. Dimmack	220 & 440 tr. 500	Direct	900	665	350 A.H.	£53,929	774 KW.	21 arc, cbn., 12×2
399	SWINTON & PENDLEBURY	Swinton & Pendlebury Urban District Council	1907	*	250 & 500	Direct	150	53	..	£10,600	130 KW.	2 arc, 16
400	TAUNTON	Taunton Corporation	1888*	E. B. Thornhill	105 & 210 tr. 500 D.C.	60~, 1-ph., & direct	1,100	564	..	£70,111	930 KW.	72 arc, 292
401	THIRSK AND SOWERBY	Northern Counties Electricity Supply Co., Ltd.	1908	H. Emery (Res.)*	230 & 460	Direct	95	71	..	..	115 KW.	..
402	TODMORDEN	Todmorden Corporation	1905	Henry Talbot	230	Direct	225	103	13.8 KW.	£20,000	188 KW.	..
403	TONBRIDGE	Tonbridge Urban District Council	1902	M. P. Plunkett	220 & 440	Direct	270	133	150 KW.	£24,030 (estd.)	261 KW.	18 arc, 64 20 Nerns
	TONYREFAIL AND GILFACH GOCH	Tonyrefail & Gilfach Goch El. Light & Power Co. Ltd.	1904	Arthur J. Arthur	220	50~, 1-ph.	75	70	..	£5,000	40 KW.	204 inc.

								1½ to ⅔; tr. 2 to 1½		scale		
£120,000	1,212 KW.	901 arc, 304 mtl.	251=2881 H.P.	..	3,686 KW.	..	Lg. 3½, or 6 & 1; pb. lg. 0.9; pr. 1		Flat rate & max. demand	2,650,000 (approx.)	Data estimated to May 15, 1909	326
£47,691	232 KW.	12 arc, 20 cbn., 8 mtl., 180 N.	5=71 H.P. ..	24=840 ..	273.5 KW.	..	Lg. 5, 4, 3 ; 1 b. lg. 3 ; pr. 2 to 1 ; tr. 1.4		Flat rate with disc., & time sw.	744,795	Lighting and traction. Data to Mar. 31, 1908	327
£70,500	664 KW.	87 arc, 162 cbn., 26 mtl.	15=81 H.P.	..	777 KW. ..	24	Lg. 4½; pb. lg. arc £20, inc. £3½ & £0½ p.a. ; pr. 4½ & 1½ ; htg. 1½		Flat rate, 2-rate mtr. w. time sw., & cont.	291,088	Data to Dec. 31, 1907	328
..	681 KW.	108 mtl. ..	8=44 H.P. ..	..	723 KW. ..	31	Lg. 7 & 2, or 4½ ; pb. lg. 54s. per 50 c.p. lp. p.a. ; pr. 4½, 1½ & 1		Max. dem., flat rate, & sl. scale	211,043	Data to Dec. 31, 1908	329
£7,000	20 KW.	..	..	..	20 KW. ..	..	Lg. 5 ; pr. 2½		Flat rate	..	2 Crossley Suction Gas plants	330
£58,371	1,041 KW.	84 arc, 35 mtl.	86=270 H.P.	24=840 H.P.	1,323 KW. ..	..	Lg. 3½ to 2½ ; pb. lg. 1½ ; pr. 2 to 1½ ; tr. 1½		Flat rate	893,662	Lighting and traction. Data to May 15, 1908	331
£54,317	701 KW.	119 arc, 4 cbn., 45 mtl.	69=200 H.P.	28=560 H.P.	1,414 KW.	4.2	Lg. 4½ & 4 ; pb. lg. £18 ; pr. 1½ ; tr. 2½ to 1½		Flat rate and sl. scale	605,163	Lighting and traction. Data to Mar. 31, 1909	332
155,340	2,250 KW.	80 arc ..	88=309 KW.	86=1,639 KW.	4,240 KW.	..	Lg. 8½ to 2½ ; pb. lg. arc £21 p.a. ; pr. 1½ ; tr. 1½		Flat rate, w. rebate 12 mt. to 8 p.m.	2,004,154	Lighting and traction. Data for 1906-7	333
£11,412	258 KW.	15 arc, 20 cbn., 4 mtl., 20 N.	14=54 H.P.	..	300 KW. ..	4	Lg. 6 ; pb. lg. 3 ; pr. 3 & 2 ..		Flat rate	88,564	Data to Dec. 31, 1907	334
£55,000	502 KW.	40 arc ..	27=108 H.P.	40=1,480 H.P.	696 KW. ..	100	Lg. 7 & 1, or 8½ (sc.) ; pb. lg. 1½ ; pr. 1½ & 1 ; tr. 1½		Max. demand and sliding scale	689,516	Lighting and traction. Data to Mar. 31, 1907	335
..	..	..	..	..	..	..	.. ..		..	..	.. ..	336
302,000 ar. 1907)	6,316 KW.	323 arc,* 464 inc.	262=778 H.P.	..	6,935 KW.	..	Lg. 4½ ; pb. lg. arc £18 (flame £10), inc. £3 3s. p.a. ; pr. 1½		Flat rate & sliding scale	3,234,050	Lighting station only. *265 large arcs, 58 flame arc. Data to Mar. 31, 1908	337
£69,000	401 KW.	33 arc, 144 cbn., 193 mtl.	169=2,591 H.P.	8=200 H.P.	3,515 KW.	11	Lg. 4 ; pb. lg. 2 ; pr. 1 ; tr. 1½		Flat rate with dis. & contract	3,491,878	Lighting and traction. Supply to Prescot Dist., S. Lanc. Trys. and B.I. & H.C. works. Data to Dec. 31, 1908	338
185,842	3,209 KW.	64 arc ..	319=1,401 KW. (inc. htg.)	..	4,649 KW.	6.5	Lg. 7 to 4½, less 15% ; pb. lg. 1 ; pr. 1½ to 1 net		Max. demand & sliding scale	1,731,000	Data to Dec. 31, 1908	339
£5,477	64 KW.	20 mtl. ..	13=19 H.P. ..	..	78 HW. ..	40	Lg. 4 ; pb. lg. 3 ; pr. 2		Flat rate	26,174	Large consumers supplied by the Yorkshire Electric Power Co. Data to Mar. 31, 1909	340
£27,288	192 KW.	15 arc, 24 cbn.	6=34½ H.P.	..	232 KW. ..	2	Lg. 6, 5 & 4½ ; pb. lg arc £15, inc. £2 8s. p.a., ½ night ; pr. 3 & 2½		Flat rate	100,842	Data to Dec. 31, 1908	341
£25,550	182 KW.	15 arc, 1 mtl.	40=510 H.P.	See other Table	595 KW.	39	Lg. 4 to 3 ; pb. lg. 2 ; pr. 2 to 0.9 ; tr. 1½		Sliding scale ..	930,787	Lighting and traction. Data to Mar. 31, 1909	342
£37,164	399 KW.	..	41=114 H.P.	..	538 KW. ..	45	Lg. 7 & 3 ; pr. 2 (daylight 1½) ..		Max. dem., flat rate, 2-rate meter (pr.)	146,263	Data to Dec. 31, 1907	343
£10,637	956 KW.	109 arc, 455 cbn., 30 mtl.	8=43 H.P. ..	..	1,116 KW.	8.8	Lg. 4½ (sch. & ch. 4) ; pb. lg. arc £16, inc. £4½ p.a. ; pr. 1½		Flat rate	703,872	Data to Mar. 31, 1909	344
£67,779	2,290 KW.	..	260=1,731 H.P.	..	4,021 KW.	9	Lg. 6 to 3 (shops 4½ to 3) ; pr. 1½		Sliding scale ..	1,247,927	Data to Dec. 31, 1908	345
£36,739	292.4 KW.	320 inc. ..	23=163 H.P.	..	1,004 KW.	..	Lg. 4½ & 4 ; pb. lg. inc. £3 p.a. ; pr. 2-1½, 1½ & 1 ; htg. 1½		Flat rate, 2-rate meter, sl. sc. for pr.	..	Part gas power..	346
£45,000	789 KW.	4 arc, 2 mtl.	14=58 H.P.	..	792 KW.	..	Lg. 7 & 4 ; pb. lg. arc £.8, inc. £2 15s. p.a. ; pr. 2		Max. demand & flat rate	220,427	.. ..	347
£26,990	375 KW.	58 arc, 8 inc.	19=20 H.P.	..	430 KW.	..	Lg. 6 & 3, or 5 ; pb. lg. 4 ; pr. 4 & 2		Max. demand & flat rate	..	.. ..	348
134,454	2,105 KW.	..	132=417 KW.	..	2,523 KW.	11	Lg 5½ ; pr. 2½ ; htg. 1½		Flat rate with discounts	680,882	Data to Dec. 31, 1908	349
£95,849	1,365 KW.	,.	217=1,267 H.P.	120=4,260 H.P.	6,146 KW.	8	Lg. 6 & 2, or 4½ with dis. ; pr. 2 to ⅔ ; tr. 1½ to 1		Max. dem., flat r., sl. sc., & contract	3,188,865	Lighting and traction. *3-phase 50~ at 3,000 volts to sub-stations. Data to Mar. 31, 1909	350
£5,758	100 KW.	8 mtl. ..	5=10 H.P. ..	..	109 KW. ..	..	Lg. 7 ; pb. lg. 2½ ; pr. 3		Flat rate	27,781	Data to Dec. 31, 1907	351
£54,574	1,335 KW.	..	79=533.5 H.P.	68=1,745 H.P.	15,385 KW.	12.1	Lg. 4 ; pr. 1½ to 1 ; tr. 1½ ..		Flat rate, with discounts	1,739,136	Lighting and traction. Discounts to large power cons. up to 40%. *Available for both lg. & tr. Data to Mar. 31, '09	352
£23,000	..	36 arc, 34 inc.	..	..	..	..	.. ..		..	..	.. ..	353
..	33 KW.	16 inc. ..	1 H.P. ..	..	35 KW. ..	..	Lg. 7		Flat rate	..	.. ..	354
£15,000	3,255 KW.	80 Nernst ..	10 H.P. ..	..	354 KW. ..	30	Lg. 6 ; pb. lg. 4 ; pr. 2		Flat rate	59,721	Gas power	355
£13,888	465 KW.	..	16=97½ H.P.	..	498 KW. ..	15	Lg. 5 less 5% ; pr. 2½ & 3 ..		Flat rate with discounts	160,876	Supply from the B.T.-H. Co.'s works at 2,200 volts. Data to Mar. 31, 1909	356
£4,500	167 KW.	..	..	..	167 KW. ..	..	Lg. 4 & 5		Flat rate	38,488	Gas power	357
£62,604	560 KW.	96 mtl. ..	50=80 H.P. ..	..	655 KW. ..	8	Lg. 7 & 4, or 6 ; pr. 4 & 1½ or 2½		Max. demand & flat rate	162,568	Gas power. Data to Dec., 1908	358
£11,574	162.5 KW.	..	20=23 H.P.	..	183 KW.	..	Lg. 7 & 2½ or 5 ; pr. 2½ & special		Max. demand & flat rate	..	Supply commenced Sept 20, 1908. T. E. Eachus, Res. eng. Data to March 31, 1909	359
£23,900	312.3 KW.	4 arc, 8 cbn.	37=123 H.P.	..	446 KW.	13.3	Lg. 5 ; pb. lg. 3 to 1½ ; pr. 3 ; htg. 1½		Flat rate	110,628	*Res dent eng. H. Dixon. Data for 1908	360
£48,000	1,034 KW.	44 arc, 31 cbn., 96 mtl., 172 N.	37=38 H.P.	80=2,000 H.P.*	2,632 KW.	100	Lg. 7 & 3, or 5½ ; pb. lg. & pr. 2½ ; tr. 2 to 1½		Max. demand & flat rate with dis.	790,958	Lighting & traction. *Energy sold to Tramway Co., 200 KW. max. demand. Data to Mar. 31, 1909	361
£28,000	112 KW.	117 Nernst..	11=30 H.P.	..	151 KW.	..	Lg. 5 ; pb. lg. contract ; pr. 2 ..		Flat rate & contrac	90,000	Suction gas plant substituted for steam, 1904. Data to June 1, 1909	362
£50,000	1,364 KW.	161 Nernst	140=1,620 H.P.	See other Table	2,984 KW.	8.16	Lg. 4½ & 3½ ; pb. lg. 0.77 ; pr. 2 & 1 w. dis. ; tr. 1.11 & 0.37		Lg. flat r., pr. max. dem. w. dis., tr. scale	2,484,631	Lighting and traction. Data to Mar. 31, 1909	363
£9,600	335 KW. ..	5 arc, 4 cbn., 180 mtl.	9=18 H.P. ..	..	348 KW.	13	Lg. 5½ & 3, or 5 ; pb. lg. 2 ; pr. 3 & 1½, or 2 with lg.		Max. demand & flat rate	83,000	No meter rents charged. Data to Mar. 31, 1909 ..	364
£02,397	6,070 KW.	117 arc ..	55=9,766 H.P.	494=15,010 H.P.	22,925 KW.	7	Lg. 3½* ; pb. lg. 1.25 ; pr. 1½ to 1† ; tr. 1.3		Max. d m., flat sl. sc., 2-rate, cont. & spl.	14,828,463	Lighting and tr. *Or 1s. per 8-C.P. per qr. & 1½d. p.u. †Or £1 per E. H. P. & ¾d. p.u. Data to Mar. 31, 1909	365
£69,826	876 KW. ..	19 inc., 14 Nernst	63=131 H.P.	..	1,022 KW.	1	Lg. 7, 4 & 2 ; pr. 4 & 1, or 2½ ..		Max. demand, and flat rate for pr.	513,046	Part water power. Data to Dec. 31, 1908	366
£14,000	317 KW. ..	..	10=40 H.P. ..	..	353 KW.	..	Lg. 6 to 4½ ; pr. 2½ to 1½ ..		Sliding scale ..	66,284	Part gas power. Data to Sept. 30, 1907	367
£09,193	1,926 KW.	..	250 H.P. ..	44=1,540 H.P.	3,416 KW.	3	Lg. 6 to 3 ; pr. 2 ; htg. 1 ; tr. 1.3		Sliding scale with discounts	837,953	Lighting and traction. Data to Dec. 31, 1908	368
£56,205	514 KW. ..	15 arc, 206 cbn., 226 mtl., 69 N.	40=40 H.P.	..	640 KW.	5	Lg. 7 & 4, or 6 ; pr. 4 & 1½, or 2½		Max. demand & flat rate	237,868	Data to Dec. 1908	369
£50,436	382 KW.	..	372 H.P.	300 H.P. ..	876 KW. ..	33	Lg. 4½ & 2½ ; pr. 2 & 1		Max. demand, flat rate & special	433,264	Lighting and traction. *Tr. 550 v. D.C. Data to Dec. 31, 1908	370
£50,000 purch.)	8,234 KW.	60 arc	1,219=11,545 H.P.	..	19,824 KW.	6.43	Lg. 4 ; pb. lg. various rates ; pr. 2 to 0.6 ; htg. 1		Flat rate with discounts	9,000,000 (approx.)	Two A.C. stns.: Nespend 4,000 KW. turbines ; Sheaf St. 4,400 KW. various types. Data to Mar. 25, 1909	371
..	237 KW.	..	30 KW. ..	..	237 KW.	..	Lg. 4 ; pr. 2½ to 1½		Flat rate & sliding scale	..	*C.W. Fairweather (Mgr.). Cons. engrs. Merz & McLellan. Data to Dec. 31, 1908	372
£62,763	516 KW.	41 arc, 1 Nernst	89=580 H.P.	948* KW.	1,083 KW.	..	Lg. 4½ & 2 ; pb. lg. 1½ ; pr. 2 & 1, or 1½ ; tr. 1½		Max. demand & flat rate	824,027	Lighting and traction. *Tramway max. demand ..	373
£53,740	800 KW. ..	51 arc, 360 cbn., 152 mtl.	186 H.P. ..	..	1,050 KW.	..	Lg. 6, 4 & 2, or 5 ; pb. lg. about 2½ ; pr. 3, 2 & 1½, w. dis. to 10%		Lg. max. dem. & flat ; p. sl. scale w. dis.	511,671	Data to March 31, 1909	374
£11,143	112 KW. ..	16 arc, 103 cbn., 10 mtl., 4 N.	11=37 H.P.	..	150 KW.	..	Lg. 5 ; pb. lg. arc £12½, glow £2 p.a. ; pr. 3		Flat rate	64,609	Data to Mar. 31, 1909	375
£44,886	348 KW.	103 mtl. ..	27 ..	..	447 KW.	17.1	Lg. 4, 1½, 6 ; pb. lg. 3 ; pr. 3 ..		Flat rate with discount	250,248	Bulk supply to Windsor E. I. Co. at 3.94d. per unit. Data to Mar. 1908	376
..	79.5 KW.	..	..	140=4,620 H.P.	3,518 KW.	..	Lg. 7 & 2½ ; pr. 1½		Max. demand & flat rate	..	Lg. & tr. Tramway Committee holds E. L. prov. order for Smethwick area	377
£79,351	1,882 KW.	92 arc, 66 inc., 6 Nernst	40=200 H.P.	50=1,250 H.P.	2,965 KW.	..	Lg. 4½ ; pb. lg. 2½ ; pr. 3 & 2 ; tr. 2½		Flat rate	..	Lighting and traction	378
£23,000	..	99 arc, 59 cbn., 41 mtl., 117 N.	60=340 H.P.	See other Table	3,193 KW. (ex. tr.)	12	Lg. 6 & 3, or 4½* ; pb. lg. arc £13 14s. N. £2 7s. 4d. ; pr. 1 & 6 or 2 ; tr. 1½		Max. demand, flat, 2 rate & Hopkinson	1,793,000 (estd.)	Lighting and traction. *Also £3 10s. per KW., and 1½d. p.u. Data to Mar. 31, 1909	379
(approx.) £97,029	3,683 KW.	75 arc, 150 inc.	70=491 H.P.	40=1,620 H.P.	4,992 KW.	..	Lg. 6, 4, & 2, or 4½ ; pb. lg. arc £20 p.a. * ; pr. 2 & 1½ ; tr. 1½ to 1½		Max. dem., flat, sl. scale, 2-rate & cont.	2,104,259	Lighting and traction. * Inc. 50/- per lamp per annum. Data to Mar. 31, 1908	380
£77,438	2,155 KW.	94 arc, 480×2 inc.	56=1,000 H.P.	70=2,100 H.P.	4,874 KW.	..	Lg. 7 & 1½, or 4 ; pb. lg. arc £22½* ; pr. 1½ to 1 ; htg. 2 ; tr. 1.5 to 1.3		Max. dem., flat, & sl. scale, w. dis.	2,954,990	Lighting & traction. *Also pb. lg. two 16-C.P. inc., £2 12s. per annum. Data to Mar. 31, 1908	381
..	420 KW.	..	129 KW. ..	..	549 KW.	..	Lg. 4 ; pr. 1½ with discount .		..	..	*Used as stand-by ; bulk from Cd. & Dm. E. P. S. Co. Cons. engrs. Merz & McLellan. Data to Dec. 31, 1908	382
£33,063	..	8 arc ..	56 H.P. ..	..	743 KW.	..	Lg. 7 & 3, or 4½ to 5 ; pr. 2½ to 1½		Max. demand & flat rate w. discount	307,321	.. ..	383
£50,000	500 KW. ..	..	250=5,000 H.P.	120=3,600 H.P.	5,000 KW.	..	Lg. 3½, less 10 %, or 4 & 2 ; pr. 2½ to ½ ; tr. 1		Max. dem., flat, sl. sc. & cont. w. dis.	10,000,000	Lighting & traction. Data to May 1, 1908	384
£10,574	564 KW. ..	5 arc, 10 cbn.	93=487 H.P.	..	1,018 KW.	..	Lg. 7 & 3, or 5* ; pb. lg. £70 p.a. ; pr. 4 & 1, or 2½, & special		Max. dem., flat, 2-rate mr. & cont.	309,608	*Free wiring 6d. per lp. per qr. Wiring and motors on hire purch. 3, 5, or 7 yrs. Data to Dec. 31, 1908	385
£40,150	567 KW.	60 arc, 96 cbn., 53 mtl., 65 N.	68=220 H.P.	..	725 KW.	10	Lg. 7 & 2, or 6 to 4½ ; pb. lg. 3.6 ; pr. 5 & 1, or 4 to 1½		Max. demand and sliding scale	317,821	Data to May 15, 1908	386
£51,000	892 KW.	49 arc, 2 inc., 1 Nernst	73=428 H.P.	90=3,150 H.P.	4,472 KW.	..	Lg. 4 ; pb. lg. arc £11½ p.a. ; pr. 1½ * ; tr. 1½		Flat rate	1,319,000	Lighting & traction. *Special rates to large consumers	387
£53,926 (approx.)	870 KW. ..	44 arc ..	116=650 KW.	..	1,542 KW.	4	Lg. 6 & 2, or 4 ; pb. lg. 2.83 ; pr. 2 to 1½		Max. demand, flat & 2-rate (t.s.) w. dis.	784,228	Data to Mar. 31, 1909	388
£35,044	577 KW. ..	..	765 H.P. ..	..	1,265 KW.	..	Lg. 7 & 2 ; pr. 1½ to 0·8. ..		Max. dem., flat, sl. sc. & cont. w. dis.	693,337	Data to Mar. 31, 1909	389
..	100 KW. ..	..	25=40 H.P.	..	129 KW.	..	Lg. 8 & 6 ; pr. 6 to 3		Flat rate	..	Gas power	390
£9,934	121 KW. ..	..	13=115 H.P. Htg. 9 KW.	..	216 KW.	35	Lg. 5 ; pr. 2½, 2, 1½ ; htg. 1½ ..		Flat rate	43,551	Greater portion of lighting done with metallic filament lamps. Data to Dec. 31, 1908	391
£76,940	618.4 KW.	98 arc, 107 mtl.	54=393.5 H.P.	See other Table	920.4 KW. (ex. tr.)	32.6	Lg. 4½, or £7 per KW. p.a. & 1½ p.u.* ; pr. 3 to 1† ; tr. 1.143		Flat rate, sl. sc. & Hopkinson	1,885,350	Lg. and tr. *Pb. lg. arc £20 (½ nt. £12), inc. £2½ p.a. †Or £1 per B.H.P. per qr. & ½d. p.u. Data to Mar. 31, 1909	392
£9,748	2,940 KW.	215 arc, 16 cbn., 27 mtl., 18 N.	725=9,027 KW.	144=3,704 H.P.	12,804 KW.	Decrease	Lg. 4½ w. dis. to 2½, or 4½ & 2½† ; pr. 2½ to ⅔, or 2½ & 1½ ; tr. 1½		Max. dem., flat w. dis., t.sw., cont. & sl.	6,584,825	l. g. & tr., 2 stations. *Tr. 550 v. † Pb. lg. arc £14 3. 8.	393
£67,640	954 KW. ..	2 Nernst ..	22=45½ H.P.	..	1,015 KW.	10	Lg. 7 & 3, or 6 ; pb. lg. £3½ per lp. p.a. ; pr. 4 & 1½, or 2½		Max. demand and flat rate	251,959	Dec. due to closing of a shipyard. Data to Mar. 31, 1909	
£0,588	964 KW.	2 arc, 193 mtl., 2 Nernst	11=108 H.P.	250 KW.	1,309 KW.	50	Lg. 7 & 2, or 5 ; pr. 4½ & 1½, or 2½† ;		Max. demand & flat rate	482,890	*Worked by Callender's Cable and Construction Co., Ltd. Data to Mar. 31, 1909	394
£2,235	745 KW. ..	14 arc, 208 mtl.	27=112 KW.	..	960 KW.	11	Lg. 5½ to 4 ; pr. 2 & 1½ ..		Sliding scale ..	346,903	*G. R. Hulme (Gen. Man.). † Pb. lg. arc £17½ (½ nt.), inc. & Nernst £3½ p.a. Data to Dec. 31, 1907	395
£3,240	2,274 KW.	74 arc, 80 mtl.	1,748 H.P. ..	..	3,845 KW.	16.7	Lg. 6 & 2, or 4½ ; pb. lg. arc £25 & £11 p.a. ; pr. 2 & 1½ ; tr. 1½ to 1		Max. demand and flat rate	2,400,333	Data to Mar., 1909	396
£3,929	774 KW.	21 arc, 173 cbn., 12×2 mtl.	243 H.P. ..	24=858 H.P.	1,912 KW.	..	Lg 4, or £6 per KW. & 2 p.u. ; pb. lg. 2.36 av. ; pr. 2 w. dis. ; tr. 1½		Flat rate & Hopkinson	887,488	Lighting & traction	397
£9,600	130 KW.	2 arc, 16 mtl.	9=25 H.P. ..	..	156 KW.	..	Lg. 4, or 1s. per 30-w. lp. & 1½d. p.u. ; pb. lg. 2½ ; pr. 1½ and 1		Flat rate†	..	*Lancs. Elec. Pr. Co. manage the undertaking. † Altern. fixed charge per lp. & 1½d. p.u. Data to Mar 31, 1909	398
£10,111	930 KW.	72 arc, 292 mtl.	98=278 H.P.	12=240 H.P.	1,456 KW.	4.6	Lg. 6 & 2 ; pr. 2 ; tr. 2 to 1 ..		Max. demand and flat rate	625,288	Lighting and traction. *Purchased from Co. in 1898. Data to Mar. 31, 1909	399
..	115 KW.	..	2 KW.	..	117 KW.	..	Lg. 4½ ; pr. 2½ & 1½		Flat rate & sliding scale	..	*C. W. Fairweather (Mgr.). Cons. engrs. Merz & McLellan. Data to Dec. 31, 1908	400
£0,000	188 KW.	..	31=55 KW.	..	243 KW.	27.6	Lg. 4½, or 6 & 2 ; pr. 2		Max. demand & flat rate	89,007	Data to Mar. 31, 1908	401
£4,000	261 KW.	18 arc, 64 mtl., 20 Nernst	14=47 H.P.	..	351 KW.	..	Lg. 6 (outside 3) ; pb. lg. arc £18, inc. £3½ ; pr. 3, 2½, 1 ; htg. 2		Max. demand and flat rate	158,000 (estd.)	Data to Mar. 31, 1909	402
£5,000	40 KW.	204 inc. ..	..	..	..	..	Lg. 6 ; pb. lg. £2 4/0 per lamp		Flat rate	..	Evanstown supplied [illegible]	

387	STOCKPORT	Stockport Corporation	1898	R. Lomax	230 & 460 tr. 500	Direct	2,050	1,440	200 KW.	£51,000	892 KW.	53 mtl., 65 N. 49 arc, 2 inc., 1 Nernst
388	STOCKTON-ON-TEES	Stockton-on-Tees Corporation	1900	J. J. Smith	230 & 460	Direct	1,050	569	75 KW.	£53,926 (approx.)	870 KW.	44 arc
389	STOKE-UPON-TRENT	Stoke-upon-Trent Corporation	1904	P. J. S. Tiddeman	240 & 480	Direct	900	274	50 KW.	£35,044	577 KW.	
390	STOWMARKET	Suffolk Electricity Supply Co., Ltd.	1896	Napier Prentice	100	Direct	78	42	50 KW.		100 KW.	
391	STRATFORD-ON-AVON	Stratford-on-Avon Electricity Co., Ltd.	1907	Cecil D. Falcke	220 & 440	Direct	100	76.5	33 KW.	£9,934	121 KW.	
392	STRETFORD	Stretford Urban District Council	1903	R. Rowland	220 & 440, tr. 550	Direct	1,500	988	200 KW.	£76,940	618.4 KW.	98 arc, 107 mtl.
393	SUNDERLAND	Sunderland Corporation	1895	A. S. Blackman	220 D.C.* 220 & 240 A.C.	Direct, & 50~, 3-ph.	9,598	4,092	Abont 320 KW.	£419,748	2,940 KW.	215 arc, 16 cbn 27 mtl., 18 N.
394	SURBITON	Surbiton Urban District Council*	1903	H. MacDonald Gill (resident)	240 & 480	Direct	380	215	90 KW.	£57,640	954 KW.	2 Nernst
395	SUTTON, CARSHALTON WALLINGTN & CHEAM	South Metropolitan Electric Tramways & Lighting Co.	1902	C. W. Durnford (Chf. Eng.)*	200 A.C., tr. 500 D.C.	50~, 1-ph., & direct	1,500	500	..	£80,588	964 KW.	2 arc, 193 mtl. 2 Nernst
396	SUTTON COLDFIELD	Sutton Coldfield Corporation	1901	T. Duesbury	230 & 460	Direct	625	283	90 KW.	£42,235	745 KW.	14 arc, 208 mtl.
397	SWANSEA	Swansea Corporation	1901	C. A. L. Prusmann	220 & 440 tr. 550	Direct and 50~, 1-ph.	2,325	1,367	78 KW.	£153,240	2,274 KW.	74 arc, 80 mtl.
398	SWINDON	Swindon Corporation	1903	A. Dimmack	220 & 440 tr. 500	Direct	900	665	350 A.H.	£53,929	774 KW.	21 arc, 173 cbn., 12 × 2 mtl
399	SWINTON & PENDLEBURY	Swinton & Pendlebury Urban District Council	1907	*	250 & 500	Direct	150	53	..	£10,600	130 KW.	2 arc, 16 mtl.
400	TAUNTON	Taunton Corporation	1888*	E. B. Thornhill	105 & 210 tr. 500 D.C.	60~, 1-ph., & direct	1,100	564	..	£70,111	930 KW.	72 arc, 292 mtl
401	THIRSK AND SOWERBY	Northern Counties Electricity Supply Co., Ltd.	1903	H. Emery (Res.)*	230 & 460	Direct	95	71	..	..	115 KW.	
402	TODMORDEN	Todmorden Corporation	1905	Henry Talbot	230	Direct	225	103	13.8 KW.	£20,000	188 KW.	
403	TONBRIDGE	Tonbridge Urban District Council	1902	M. P. Plunkett	220 & 440	Direct	270	133	150 KW.	£24,000 (estd.)	261 KW.	18 arc, 64 mtl. 20 Nernst
404	TONYREFAIL AND GILFACH COCH	Tonyrefail & Gilfach Goch El. Light & Power Co. Ltd.	1904	Arthur J. Arthur	220	50~, 1-ph.	75	70	..	£5,000	40 KW.	204 inc.
405	TOPSHAM	Topsham Electricity Supply Co., Ltd.	1905	H. C. Gould	100	Direct	22	18.5	14 KW.	£1,927	92 KW.	69 mtl.
406	TORQUAY	Torquay Corporation	1898	P. Storey	200	50~, 1-ph.	625	318	..	£46,940	763 KW.	53 arc, 307 inc. 150 Nernst
407	TOTNES	Electric Supply Corporation Ltd.	1904	K. A. Scott-Moncrieff*	225 & 450	Direct	66	30	35 KW.	£13,500	101 KW.	
408	TOTTENHAM	North Metropolitan Electric Power Supply Co.	1908	E. T. R. Murray, Eng. in chief*	415 & 240	50~, 3-ph.	500 (sub-stn.)	190	..	£22,362 (1908)	174 KW.	103 arc
409	TRAFFORD PARK & SALE	Trafford Power & Light Supply (1902) Ltd.	1899	J. J. McGregor	250 & 500 D.C. 3,000 A.C.	Direct & 30~, 3-ph.	3,100*	2,548	..	£156,500	..	
410	TREETON	Treeton Parish Council	1897	W. H. Barwell	1,250	Direct	13	..	..	..	..	25 flame arcs
411	TUNBRIDGE WELLS	Tunbridge Wells Corporation	1895	J. W. Beauchamp (Res.)*	220	67.5~, 1-ph.	1,200	682	..	£81,826	1,951 KW.	79 arc, 157 cbn., 69 mtl.
412	TWICKENHAM, HAMPTON & TEDDINGTON*	Twickenham & Teddington Electric Supply Co., Ltd.	1902	M. Farrer	240 & 480	Direct	810	622	85 KW.	£223,149	2,491 KW.	
413	TYNEMOUTH	Tynemouth Corporation	1901	C. Turnbull	220 & 440 tr. 550	Direct	1,070*	1,040	110 KW.	£90,404	1,107.4 KW.	24 arc, 8 cbn., 35 mtl., 89 N.
414	UXBRIDGE AND DIST.	Uxbridge & District Electric Supply Co., Ltd.	1902	A. Randall Bell	200	50~, 1-ph.	1,040	297	..	£81,360	870 KW.	1 arc, 54 mtl.
415	VENTNOR, BONCHURCH AND ST. LAWRENCE	Isle of Wight Electric Light and Power Co., Ltd.	1899	A. E. Mayes (Man.) (Asst.) C. Grut	210	Direct	335	200	100 KW.	£56,610	550 KW.	117 cbn., 2 mtl. 35 Nernst
416	WAKEFIELD	Wakefield Corporation	1898	H. A. Nevill	200	60~, 2-ph.	1,450	927	..	£83,581	..	64 arc, 93 mtl.
417	WALLASEY	Wallasey Urban District Council	1897	J. A. Crowther	100 & 200 A.C. 500 D.C.	50~, 1-ph., & direct	2,550	1,228	..	£93,561	1,945 KW.	60 arc, 120 inc
418	WALSALL	Walsall Corporation	1895	A. S. Barnard	105 & 210 tr. 500	Direct	1,730	980	..	£110,131	1,406 KW.	19 arc, 10 mtl. 12 N.
419	WALTHAMSTOW	Walthamstow Urban District Council	1901	G. R. Spurr	230 & 460	Direct	1,900	726	250 KW.	£132,000	1824.6 KW.	89 arc, 460 inc. 8 Nernst
420	WALTON-ON-NAZE	Coast Development Corporation	1903	E. A. Lambert	230	Direct	100	90	65 KW.	..	145 KW.	1 arc, 105 mtl.
421	WALTON-ON-THAMES	Urban Electric Supply Co., Ltd.	1904	Herbert W. Watts	240 & 480	Direct	105	122	175 KW.	£47,959	715 KW.	4 × 2 mtl., 50 N.
422	WARRINGTON	Warrington Corporation	1900	F. V. L. Mathias	230, 460 D.C. 220, 380 A.C.*	Direct, & 50~, 3-ph.*	2,150	1,220	800 A.H.	£90,000	2,908 KW. (inc. mtrs.)	32 arc, 53 cbn.
423	WATFORD	Watford Urban District Council	1899	F. W. Purse	200	50~, 1-ph.	1,130	577	56 KW. for 2 h.	£88,520	1,405 KW.	18arc, 2170cn., 100mtl. (apprx)
424	WEDNESBURY	Wednesbury Corporation	1904	W. Fennell	230 & 460	Direct	520	189	75 KW. for 3 h.	£20,000 (approx.)	341 KW.	
425	WELLINGBOROUGH	County of Northampton El. Power & Traction Co., Ltd.	1903	Wm. J. S. Jones	230 & 460	Direct	300	175	70 KW.	..	168 KW.	261 inc., 6 Nernst
426	WEST BROMWICH	West Bromwich Corporation	1901	W. A. Jackson	230 & 460 tr. 500	Direct	1,550	1,056	175 KW.	£73,000 (approx.)	759 KW.	81 arc, 160 mtl.
427	WEST HAM	West Ham Corporation	1899	..	100 to 500 D.C.*	50~, 1 & 2-ph., & direct	11,400	6,100	400 KW.	£435,000 (approx.)	3,583 KW.	361arc, 251mtl.
428	WEST HARTLEPOOL	West Hartlepool Corporation	1901	H. F. Friederichs	230 & 460	Direct	1,600	945	69 KW.	£95,367	1,897 KW.	89 arc, 26 mtl.
429	WESTON-SUPER-MARE	Weston-super-Mare & District Electric Supply Co., Ltd.	1901	G. Charlton	230 & 460	Direct	1,100	442	100 KW.	..	700 KW.	
430	WEYBRIDGE	Urban Electric Supply Co., Ltd.	1902	Herbert W. Watts	240 & 480	Direct	580	401	45 KW.	£74,095	802 KW.	
431	WEYMOUTH & MELCOMBE REGIS	Weymouth Corporation	1904	Jas. H. Bolam	230 & 460	Direct	694	325	130 KW.	£51,285	666 KW.	48 arc + 96 cbn., 582 mtl.*
432	WHITBY	Whitby Urban District Council	1902	L. H. King	230 & 460	Direct	400	138	23 KW.	£38,400	371 KW.	31 arc, 314 inc., 121 Nernst
433	WHITCHURCH AND PANCBOURNE	Whitchurch and Pangbourne Electric Supply Co., Ltd.	1903	D. H. Coorubs	240 & 480	Direct	108	30	30 KW.	£6,050	100 KW.	
434	WHITEHAVEN	Whitehaven Corporation	1893	B. Sankey	210, 420, & 440	Direct	386	230	105 KW.	£43,467	500 KW.	9 arc, 500 inc.
435	WIGAN	Wigan Corporation	1900	J. Slevin	230 & 460 tr. 550	Direct	1,960	1,805	675 A.H.	£131,780	1,291 KW.	22 arc, 12 inc., 3 N., 6 mtl.
436	WILLESDEN	Willesden Urban District Council	1903	J. G. Bruce	240 & 480	Direct	900	1,358	97 KW.	£181,605	2,578 KW.	205 arc, 200 inc.
437	WIMBLEDON & MERTON	Wimbledon Corporation	1899	H. Tomlinson-Lee	220	50~, 1-ph.	2,685	1,507	..	£198,565	4,725 KW.	89 arc, 1,110 mtl.
438	WINCHESTER	Winchester Electric Light & Power Co., Ltd.	1898	H. N. Warburton	210 & 420	Direct	850	443	85 KW.	£89,940	1,656 KW.	
439	WINDERMERE AND AMBLESIDE	Windermere & District Electricity Supply Co., Ltd.	1893	C. Walker (Man.)	100 & 200	100~, 1-ph.	275	134	..	£43,316	483 KW.	129 cbn.
440	WINDSOR & ETON	Windsor Electrical Installation Co., Ltd.	1895	A. E. Farrow	110 & 220	Direct & 50~, 1-ph.	530 D.C., 100 A.C.*	525	130 KW.	£84,769	1,289 KW.	Eton, 12 arc, 53 × 2 mtl.
441	WISHAW	Wishaw Corporation	1905	Ernest F. Cox	240 & 480	Direct	200	181	..	£21,397	543 KW.	48 arc, 116 × 2 mtl.
442	WITNEY	Witney Electric Supply Co., Ltd.	1903	F. G. Curel	220	Direct	120	80	15.4 KW.	£10,518	150 KW.	
443	WOKING	Woking Electric Supply Co., Ltd.	1890	J. G. McLean	200	100~, 1-ph.	1,175	509	..	£116,550	..	
444	WOLVERHAMPTON	Wolverhampton Corporation	1895	C. E. C. Shawfield	220 & 440 D.C. 230,400 A.C.*	Direct & 50~, 3-ph.	5,230	3,660	385 KW. & 350 KW	..	2,586 KW.	62 arc, 193 inc. 193 N.
445	WORCESTER	Worcester Corporation	1894	C. M. Shaw	100, 200 A.C. 230, 460 D.C.	100~, 1-ph., & direct	2,236	954	150 KW.	£145,410	1,443 KW.	60 arc, 85 × 2 cbn.
446	WORKSOP	Worksop Urban District Council	1901	J. Percival Crowther	220 & 440	Direct	540	286	92 KW.	£27,822	518 KW.	35 arc, 136 cbn.
447	WORMIT	Tayside Electric & Gas Light Co., Ltd.	1898	E. A. Stewart	230	Direct	45	..	..	..	45 KW.	
448	WORTHING	Worthing Corporation	1901	G. Porter	230 & 460	Direct	538	347	69 KW.	£56,801	942 KW.	115 arc, 2 cbn., 34 mtl.
449	WREXHAM	Wrexham Corporation	1901	W. G. Pickvance	230 & 460 tr. 500	Direct	735	380 lg., 200 tr.	..	£38,975	722 KW.	42 arc, 37 cbn., 100 mtl., 35 N.
450	YARMOUTH	Yarmouth Corporation	1895	G. Bryant	100 & 200 tr. 500	83~, 1-ph.	735	382	..	£95,000	902 KW.	181 arc, 100 mtl.
451	YORK	York Corporation	1900	J. W. Hame	230 & 460	Direct	1,860	1,002	400 KW.	£125,798	2,016 KW.	108 arc, 35 mtl.

ORDUCT

CONDUIT

ELLED

"SANTONI" FLAME LAMP.

PATTERN 1909.

Inverted Arcs.

Enclosed Lamp,

Up to 100 Hours Burning.

		53 mtl., 65 N.						Lg. 7 & 2, or 6 to 4½; pb. lg. 3.6; pr. 5 & 1, or 4 to 1½	Max. demand and sliding scale	317,521	Data to May 15, 1908	386
000	892 KW.	49 arc, 2 inc., 1 Nernst	73=428 H.P.	90=3,150 H.P.	4,472 KW.	..	Lg. 4; pb. lg. arc £11½ p.a.; pr. 1½"; tr. 1½	Flat rate	1,319,000	Lighting & traction. *Special rates to large consumers	387
925	870 KW. ..	44 arc ..	116=650 KW.	..	1,542 KW.	4	Lg. 6 & 2, or 4; pb. lg. 2.83; pr. 2 to 1½	Max. demand, flat & 2-rate (t.s.) w. dis.	784,228	Data to Mar. 31, 1909	388
044	577 KW. ..	..	765 H.P. ..	..	1,265 KW.	..	Lg. 7 & 2; pr. 1½ to 0·8.. ..	Max. dem., flat, sl. sc. & cont. w. dis.	693,337	Data to Mar. 31, 1909	389
	100 KW. ..	..	25=40 H.P.	..	129 KW.	..	Lg. 8 & 6; pr. 6 to 3	Flat rate	..	Gas power	390
384	121 KW. ..	..	13=115 H.P. Htg. 9 KW.	..	216 KW.	35	Lg. 5; pr. 2½, 2, 1½; htg. 1½ ..	Flat rate	43,551	Greater portion of lighting done with metallic filament lamps. Data to Dec. 31, 1908	391
940	618.4 KW.	98 arc, 107 mtl.	54=393.5 H.P.	See other Table	920.4 KW. (ex. tr.)	32.6	Lg. 4½, or £7 per KW. p.a. & 1½ p.u.*; pr. 3 to 1†; tr. 1.143	Flat rate, sl. sc. & Hopkinson	1,885,350	Lg. and tr. *Pb. lg. arc £20 (½ nt. £12), inc. £2½ p.a. †Or £1 per B.H.P. per qr. & ½d. p.u. Data to Mar. 31, 1909	392
748	2,940 KW.	215 arc, 16 cbn., 27 mtl., 18 N.	725=9,027 KW.	144=3,704 H.P.	12,804 KW.	Decrease	Lg. 4½ w. dis. to 2½, or 4½ & 2½†; pr. 2½ to ⅜, or 2½ & 1½; tr. 1½	Max. dem., flat w. dis., t.sw., cont. & sl.	6,584,835	Lg. & tr., 2 stations. *Tr. 550 V. †Pb. lg. arc £14 3. 8. Dec. due to closing of a shipyard. Data to Mar. 31, 1909	393
340	954 KW. ..	2 Nernst ..	22=45½ H.P.	..	1,015 KW.	10	Lg. 7 & 3, or 6; pb. lg. £3½ per lp. p.a.; pr. 4 & 1½, or 2½	Max. demand and flat rate	251,959	*Worked by Callender's Cable and Construction Co., Ltd. Data to Mar. 31, 1909	394
338	964 KW.	2 arc, 193 mtl., 2 Nernst	11=108 H.P.	250 KW.	1,309 KW.	59	Lg. 7 & 2, or 5; pr. 4½ & 1½, or 2½†	Max. demand & flat rate	482,890	*G. R. Hulme (Gen. Man.). †Pb. lg. arc £17½ (½ nt.), inc. & Nernst £3⅜ p.a. Data to Dec. 31, 1907	395
335	745 KW. ..	14 arc, 208 mtl.	27=112 KW.	..	960 KW.	11	Lg. 5½ to 4; pr. 2 & 1½ ..	Sliding scale ..	346,933	Data to Mar., 1909	396
340	2,374 KW.	74 arc, 80 mtl.	1,748 H.P. ..	..	3,845 KW.	16.7	Lg. 6 & 2, or 4½; pb. lg. arc £25 & £11 p.a.; pr. 2 & 1½; tr. 1½ to 1	Max. demand and flat rate	2,400,333	Lighting and traction. Arc lighting being extended. Data to Mar., 1909	397
929	774 KW.	31 arc, 173 cbn., 12×2 mtl.	243 H.P. ..	24=858 H.P.	1,912 KW.	..	Lg 4, or £6 per KW. & 2 p.u.; pb. lg. 2.36 av.; pr. 2 w. dis.; tr. 1½	Flat rate & Hopkinson	887,488	Lighting & traction	398
000	130 KW.	2 arc, 16 mtl.	9=25 H.P. ..	..	156 KW.	..	Lg. 4, or ls. per 30-w. lp. & 1½d. p.u.; pb. lg. 2½; pr. 1½ and 1	Flat rate†	..	*Lancs. Elec. Pr. Co. manage the undertaking..† Altern. fixed charge per lp. & 1½d. p.u. Data to Mar 31, 1909	399
11	930 KW.	72 arc, 292 mtl.	98=278 H.P.	12=240 H.P.	1,456 KW.	4.6	Lg. 6 & 2; pr. 2; tr. 2 to 1 ..	Max. demand and flat rate	625,288	Lighting and traction. *Purchased from Co. in 1893. Data to Mar. 31, 1908	400
	115 KW.	..	2 KW. ..	..	117 KW.	..	Lg. 4½; pr. 2½ & 1½	Flat rate & sliding scale	..	*C. W. Fairweather (Mgr.). Cons. engrs. Merz & McLellan. Data to Dec. 31, 1908	401
00	188 KW.	..	31=55 KW.	..	243 KW.	27.6	Lg. 4½, or 6 & 2; pr. 2	Max. demand & flat rate	89,007	Data to Mar. 31, 1908	402
00	261 KW.	18 arc, 64 mtl., 20 Nernst	14=47 H.P.	..	351 KW.	..	Lg. 6 (outside 3); pb. lg. arc £18, inc. £3⅜; pr. 3, 2½, 1; htg. 2	Max. demand and flat rate	158,000 (estd.)	Data to Mar. 31, 1909	403
.)	40 KW.	204 inc. ..	..	..	..	..	Lg. 6; pb. lg. £2 4/0 per lamp per annum	Flat rate	..	Evanstown supplied for Ogmore Council; 43 street lights and private supply	404
27	92 KW.	69 mtl. ..	8=16 H.P. ..	..	..	22	Lg. 5; pr. 3½	Flat rate and contract	19,027	.. ..	405
40	763 KW.	53 arc, 307 inc., 150 Nernst	6=15 H.P. ..	..	831.5 KW.	..	Lg. 7 & 3; pb. lg. arc £20, inc. £2½ p.a.; pr. 2½	Max. demand and flat rate	..	.. ..	406
00	101 KW.	..	4=7 H.P. ..	..	108.7 KW.	15.4	Lg. 4½; pr. 3; htg. 1½	Flat rate .. .	28,945	*Resident eng., F. Howlett. Data for 1908, ...	407
62	174 KW.	103 arc ..	23=101½ H.P.	..	298.5 KW.	..	Lg. 7 & 2, or 5; pb. lg. £16 per lp. p.a.; pr. 4 & 1, or 3 & 1	Max. demand, flat rate & time switch	168,781	*Resident eng., J. Wilson. Data to Mar. 31, 1909 ..	408
00	..	..	..	..	..	..	Lg. 4 & 1½; pr. 1½ & ½	Max. demand ..	3,601,785	Bulk supply to Sale U.D.C. *Extension of 1,000 KW. in progress. Data to Mar. 31, 1908	409
	..	25 flame arcs	..	..	..	..	.. ..	..	..	Electricity supplied by Rother Vale Collieries, Ltd. Data to April 30, 1909	410
26	1,951 KW.	79 arc, 157 cbn., 69 mtl.	39=82 H.P.	..	2,137 KW.	3.2	Lg. 6 & 3, or 4½; pb. lg. 1.93; pr. 2½ to 1½	Max. demand, flat rate & 2 rate mtr.	899,733	*H. Boot, Cons. Engr. Data to Mar. 1909	411
49	2,491 KW.	..	64=323 H.P.	..	2,814 KW.	11.4	Lg. 7 & 3, or 5½ w. free lamps; pr. 4 & 1½, or 2½	Max. demand, flat rate & 2-rate meter	880,788	*Also S. Margarets o/T., Hampton Wick, Hampton Ct. and E. Molesey Data to Dec., 1908	412
04	1,107.4 KW.	24 arc, 8 cbn., 35 mtl., 89 N.	119=1,493 H.P.	27 cars ..	2,483 KW. (ex. tr.)	14.8	Lg. 5 & 2, or 4½†; pr. 2½ & 1½, or 1½ & spl. ; tr. 1½ to 1(T side, 1½)	Max. demand and flat rate	1,454,083	Lg. & tr. *Bulk supply, 1,000 KW., from Carville. †Pb. lg., arc £16 & £13; N. £2, p.a. Data to Mar. 25, 1908	413
60	870 KW.	1 arc, 54 mtl.	49=360 K.W.	..	1,230 KW.	10.6	Lg. 7 (rural), 5 (urban); pb. lg. £2/5/6 per lp. p.a.; pr. 3 & ⅜, or 2½	Max. demand and flat rate ..	392,111	Output reduced owing to large user ceasing operations. Data to Dec. 31, 1908	414
10	555 KW.	117 cbn., 2 mtl., 85 Nernst	35=70 H.P.	..	695 KW.	2	Lg. 7 & 4, or 6; pr. 4 & 1½, or 2½	Max. demand, flat rate & contract	235,416	Data to Dec., 1908	415
81	..	64 arc, 93 mtl.	163=1,264 H.P.	..	2,455 KW.	..	Lg. 4 (ch. 3), pb. lg. arc £13½, inc. £2 p.a.; pr. 1½ to 1 (hoists, 2)*	Flat rate	1,082,057	*Electricity for domestic purposes, 1d. p.u. Data to Mar. 31, 1909	416
31	1,945 KW.	60 arc, 120 inc.	51=294 H.P.	See other Table	2,190 KW.	11.1	Lg. 4 to 3; pb. lg. arc £20 p.a.; pr. 2; tr. 1½	Sliding scale and flat rate	1,949,126	Lighting and traction	417
31	1,406 KW.	19 arc, 13 mtl., 12 N.	455 KW. ..	36cars=512KW	2,385 KW.	..	Lg. 6 & 2, or 4; pb. lg. £488 p.a.; pr. 2 to 1½; tr. 1½	Max.dem.&flat rate w. dis. to lge. cons.	1,511,277	Lighting and traction. Data to Dec. 31, 1908	418
00	1824.6 KW.	89 arc, 460 inc., 8 Nernst	390 H.P. ..	See other Table	1,743 KW. (ex. tr.)	..	Lg. 4 w. dis.; pb. lg. 3 & 2; pr. 1½ to 2½	Flat rate	..	Lighting and traction. Gas power..	419
	145 KW.	1 arc, 105 mtl.	2=6 H.P. ..	1=15 H.P.	157.5 KW.	18	Lg. 6; pb. lg. arc £12, inc. £2/17/6 p.a.	Flat rate	60,300	Lighting and traction. Data to Mar. 25, 1909	420
59	715 KW.	4 × 2 mtl., 50 N.	12=40 H.P.	..	776 KW.	13	Lg. 7 & 3, or 5½; pb. lg. 2 mtl., £3 p.a. (N. free); pr. 4 & 1½, or 2½	Max. demand and flat rate	225,105	Energy transmitted from Weybridge to Walton at 2,500 V. D.C. Data to Dec. 31, 1908	421
00	2,908 KW. (inc. mtrs.)	82 arc, 53 cbn.	..	42=798 H.P.	3,650 KW.	12	Lg. 6 & 2, or 4 (ch. 3½); pb. lg. £630 p.a.; pr. 2 & 1; tr. 1½. No mtr. rent	Max. dem., flat w. dis., pr. sl. scale	2,578,632	Lighting and traction. *220 volts 1-ph., 380 v. 3-ph.; tr. 500 V. D.C. Data to Mar. 31, 1909	422
20	1,405 KW.	18arc, 2170cn., 100mtl. (apprx)	110=420 H.P.	..	1,799 KW.	20.7	Lg. 7 & 3, or 5; pb. lg. 3; pr. 2 to 1	Max. dem., flat, sl. scale & 2-rate w.t.sw.	958,000 (estd.)	*Total equivalent 32-watt lamps. Data to Mar. 31, 1909	423
00	341 KW.	..	426 KW. ..	..	767 KW.	85	Lg. 6 & 1½, or 4 (½d. discount); pr. 1½ to ¾	Max. demand, flat rate & 2-rate meter	223,708	System changed over during year from bulk purchase to self-generating with Mond gas. Data for 1908	424
.)	168 KW.	261 inc., 6 Nernst	21=150 H.P.	..	375 KW.	..	Lg. 7 & 2½; pb. lg. 2½; pr. 2½ & 3½ (2-rate, 1 & 3)	Max.dem., flat, 2-rate w.t. sw. & contract	183,000	Data to Dec. 31, 1908	425
00	759 KW.	81 arc, 160 mtl.	142=1,300 H.P.	30=900 H.P.	2,858 KW.	18	Lg. 4½ & 1½, or 3½; pb. lg. 0.83*; pr. 1½ to 0.75; tr. 2 to 1½	Max. demand, flat rate, sl. sc., & cont.	2,025,750	Lg. & tr. *Pb. lg. £15 p.a., 2 arcs to 11 p.m., 50-C.P. to dawn; 32s., 2 25-C.P. mtl. 11 to dn. Data to Mar. 31 1909	426
00	3,588 KW.	361 arc, 251 mtl.	833=6,512 KW.	3,730 KW. ..	14,110 KW.	19	Lg. 3; pb. lg. 1.5; pr. 1; tr. 0.95	Flat rate, with dis., contract, special	15,522,035	*Lighting and traction; also 50 to 6,000 V. A.C., & tr. 500 D.C. Data to Mar. 31, 1909	427
7	1,897 KW.	89 arc, 23 mtl.	211=1,756 H.P.	..	3,770 KW.	8	Lg. 4 & 3, or 6 & 2 m.d.; pb. lg. 1½; pr 2 to ⅔; ckg. 1	Max. dem. & flat rate; pr. sl. scale	1,977,787	Data to Mar. 31, 1909	428
	700 KW.	..	23=183 H.P.	24=480 H.P	1,194 KW.	13	Lg. 7 & 2, or 5; pr. 4½ & 1½, or 2½; tr. 2	Max. demand and flat rate	404,774	Lighting and traction. Data to Dec. 31, 1908	429
05	802 KW.	..	38=80 H.P.	..	935 KW.	9	Lg. 7 & 3, or 5½ (slot m., 7 incl.); pr. 4 & 1½, or 2½	Max. demand and flat rate	565,648	Energy transmitted to Walton at 2,500 V. D.C. Data to Dec. 31, 1908	430
35	666 KW.	48 arc + 96 cbn., 582 mtl.*	47=172 H.P. (Htg. 53 KW.)	..	903 KW.	14.5	Lg. 5; pr. 2½ w. dis.; pb. lg. arc £15½, inc. £4, per post p.a.*	Flat rate with discounts	388,051	*Two cbn. lamps on arc posts; 282 posts with 2 or 4 mtl. lamps=582 lamps. Data to Mar. 31, 1909	431
00	371 KW.	31 arc, 314 inc., 121 Nernst	23=102 H.P.	..	480.5 KW.	..	Lg. 4½; pb. lg. 3; pr. 2, 1½ & 1	Max. dem., flat rate, 2-rate mtr. & cont.	225,309	.. ..	432
50	100 KW.	..	1=6½ H.P.	..	104 KW.	..	Lg. 8; pr. 2, 3 & 4	Flat rate and contract with dis.	25,363	Data to Dec. 31, 1908	433
37	500 KW.	9 arc, 500 inc.	28=126 H.P.	..	634.5 KW.	4.3	Lg. 4½*; pb. lg. 4; pr. 2 to 1, or 4½ & 1½ to 1 by 2-rate meter	Hopkinson, flat rate, sl. scale & 2-rate	282,280	*Or £8 per an. per KW. & 2d. per unit. Data to Mar. 31, 1907	434
00	1,291 KW.	22 arc, 12 inc., 3 N., 6 mtl.	210=1,721 H.P.	See other Table	2,629 KW.	..	Lg. 5, 4, 3; pb. lg. 3; pr. 1; htg. 2; tr. 1½	Flat rate	3,116,581	Lighting and traction	435
05	2,578 KW.	205 arc, 200 inc.	722 H.P.	..	3,225 KW.	15	Lg. 8 & 1, or 5; pb. lg. arc £13 4s.; pr. 1½ to 0.58	Max. demand & flat rate	1,923,930	Bulk supply from North Met. E. P. S. Co. Data to Mar. 31, 1908	436
35	4,735 KW.	89 arc, 1,110 mtl.	84=705 H.P.	..	5,407 KW.	12.8	Lg. 4½ to 3½; pb. lg. 2½; pr. 2 (above 2 s.r., 1½)	Sliding scale ..	2,343,280	Motors of 393 B.H.P. pumping sewage. Data to Mar. 31, 1909	437
10	1,656 KW.	..	69=103 H.P.	..	1,888 KW.	4	Lg. 7, 4, & 2; pr. 4 & 1½.. ..	Max. demand, flat rate & contract	519,535	Data to Dec 31, 1908	438
6	483 KW.	129 cbn. ..	16=23 H.P.	..	493 KW.	..	Lg. 7; pb. lg. 3; pr. 3½.. ..	Flat rate	134,071	Data to Dec. 31, 1908	439
99	1,289 KW.	Eton, 12 arc, 53×2 mtl.	70=221 KW.	..	1,503 KW.	..	Lg. 6 w. dis.; pr. £3 p.a. per H.P. & 1d. p.u.; htg. 3 w. dis.†	Flat rate w. discount & Hopkinson	646,504	*Adtn'l b'lk 'ply from Slough & Datchet Co. †Pb. lg. arc £22, £16; twin tant. £4⅜ p.a. Data to Dec. 31, 1908	440
97	543 KW.	48 arc, 116 × 2 mtl.	95=300 H.P.	..	850 KW.	Decrease	Lg. 4; pb. lg. £950 p.a.; pr. 3 to 1	Flat rate	235,440	Total lamps connected decreased; also sales for lighting decreased owing to mtl. fil. lamps. Data for 1908	441
18	150 KW.	..	5=26 H.P.	..	170 KW.	5	Lg. 6 & 5; pr. 2½..	Flat rate	46,725	Gas power. Data for 1908	442
50	..	..	14=50 H.P.	..	1,700 KW.	..	Lg. 6½; pr. 4 & 2; htg. 2 ..	Flat rate	619,813	Bulk supply at 2,000 volts to L. & S. W. Ry. Co. Data to Dec. 31, 1908	443
	2,586 KW.	62 arc, 193 inc. 193 N.	330=3,388 H.P.	..	8,169 KW.	50	Lg. 5 & 2, or 4; pb. lg. arc £20 p.a.†; pr. 2 & ⅜, or 1 to ⅜; tr. 1⅓	Various methods..	..	Lighting and traction. *Tr. 500 V. †Pb. lg., inc. £2⅜ per lp. p.a. Data to Mar. 31, 1909	444
10	1,443 KW.	60 arc, 85×2 cbn.	143=825 H.P. 31 radrs.	30=750 H.P.	2,720 KW.	..	Lg. 6½ & 3, or 4½ (shops 5); pr. 2½ & 1 (rest. hrs. 1); tr. 2 to 1½	Max. demand, flat rate & sl. scale	1,545,772	Lighting and traction; old station A.C., new one D.C. Data to Mar. 31, 1909	445
62	518 KW.	35 arc, 135 cbn.	32=155 H.P.	..	704.5 KW.	27.9	Lg. 4; pb. lg. 2½; pr. 1½ ..	Flat rate with discounts	329,071	Data to Mar. 31, 1908	446
	45 KW.	..	..	..	45 KW.	..	Lg. 5	Flat rate	15,000	Suction-gas plant. Data to 1908	447
91	942 KW.	115 arc, 2 cbn., 34 mtl.	93=106 H.P.	..	1,006 KW.	23	Lg. 5 & 4½; pb. lg. 5; pr. 1½ ..	Flat rate with discounts	493,667	Data to Mar. 31, 1908	448
75	722 KW.	42 arc, 37 cbn., 100 mtl., 35 N.	33=112 H.P.	20=500 H.P.	1,286 KW.	19	Lg. 5, or 5 & 2½ (½ dis.), outside arc 3*; pr. 2½ to 1½ (½ dis.); tr. 2½ to 1	Flat rate & sliding scale	525,194	Lg. & tr. *Also 12½% on net ast. & 1d. p.u. Pb. lg. arc £20, £15, N. £4½, inc. £3 3s. & £2½. Data to Mar. 31, 1909	449
00	902 KW.	181 arc, 100 mtl.	33=70 H.P....	..	..	..	Lg. 5, less 5%; pb. lg. arc, £16 p.a.; pr. 2½ A.C., 2 D.C.	Max. dem., flat rate w. dis., cont., t. sw.	1,513,937	Lighting and traction. Data to Mar. 31, 1908 . ..	450
08	2,016 KW.	108 arc, 35 mtl.	178=1,108 H.P	..	2,776 KW.	13	Lg. 7 & 1½, or 4½ to 3½, ch., &c., 3; pr. 1½ to 1*	Max. dem., flat, 2-rate meter, & contract	1,342,008	*Pb. lg. arc (open) £17, (enc.) per pair £12 12/0; inc., £2 17s. p.a. Data to Mar. 31, 1909	451

AMP.

rcs.

mp,

ning.

THE
NEW
1909 PATTERN
"N C" TYPE
BASTIAN

WESTERN ELECTRIC
COMPANY
Manufacture and Lay
CABLES
FOR
ELECTRIC LIGHT
TELEPHONES

406	TORQUAY	Torquay Corporation	1898	P. Storey	200	50~, 1-ph.	635	319	..	£46,940	763 KW.	58 arc, 307 inc 150 Nernst
407	TOTNES	Electric Supply Corporation Ltd.	1904	K. A. Scott-Moncrieff*	225 & 450	Direct	66	30	35 KW.	£13,500	101 KW.	..
408	TOTTENHAM	North Metropolitan Electric Power Supply Co.	1908	E. T. R. Murray, Eng. in chief*	415 & 240	50~, 3-ph.	500 (sub-stn.)	190	..	£22,362 (1908)	174 KW.	103 arc ..
409	TRAFFORD PARK & SALE	Trafford Power & Light Supply (1902) Ltd.	1899	J. J. McGregor	250 & 500 D.C. 3,000 A.C.	Direct & 30~, 3-ph.	3,100*	2,548	..	£156,500	..	..
410	TREETON	Treeton Parish Council	1897	W. H. Barwell	1,250	Direct	13	..	..	..	..	25 flame arcs
411	TUNBRIDGE WELLS	Tunbridge Wells Corporation	1895	J. W. Beauchamp (Res.)*	220	67.5~, 1-ph.	1,200	682	..	£81,827	1,951 KW.	79 arc, 157 cbn., 69 mtl.
412	TWICKENHAM, HAMPTON & TEDDINGTON*	Twickenham & Teddington Electric Supply Co., Ltd.	1902	M. Farrer	240 & 480	Direct	810	622	85 KW.	£223,149	2,491 KW.	..
413	TYNEMOUTH	Tynemouth Corporation	1901	C. Turnbull	220 & 440 tr. 550	Direct	1,070*	1,040	110 KW.	£90,404	1,107.4 KW.	24 arc, 8 cbn 35 mtl., 89 N
414	UXBRIDGE AND DIST.	Uxbridge & District Electric Supply Co., Ltd.	1902	A. Randall Bell	200	50~, 1-ph.	1,040	297	..	£81,360	870 KW.	1 arc, 54 mtl.
415	VENTNOR, BONCHURCH AND ST. LAWRENCE	Isle of Wight Electric Light and Power Co., Ltd.	1899	A. E. Mayes (Man.) (Asst.) C. Grut	210	Direct	335	200	100 KW.	£56,610	550 KW.	117 cbn., 2 mtl 35 Nernst
416	WAKEFIELD	Wakefield Corporation	1898	H. A. Nevill	200	60~, 2-ph.	1,450	927	..	£83,581	..	64 arc, 93 mtl
417	WALLASEY	Wallasey Urban District Council	1897	J. A. Crowther	100 & 200 A.C. 500 D.C.	50~, 1-ph., & direct	2,550	1,228	..	£93,561	1,945 KW.	60 arc, 120 in
418	WALSALL	Walsall Corporation	1895	A. S. Barnard	105 & 210 tr. 500	Direct	1,730	980	..	£110,131	1,406 KW.	19 arc, 10 mtl 12 N.
419	WALTHAMSTOW	Walthamstow Urban District Council	1901	G. R. Spurr	230 & 460	Direct	1,900	726	250 KW.	£132,000	1324.6 KW.	89 arc, 460 inc 8 Nernst
420	WALTON-ON-NAZE	Coast Development Corporation	1908	E. A. Lambert	230	Direct	100	90	65 KW.	..	145 KW.	1 arc, 105 mt
421	WALTON-ON-THAMES	Urban Electric Supply Co., Ltd.	1904	Herbert W. Watts	240 & 480	Direct	105	122	175 KW.	£47,959	715 KW.	4 × 2 mtl., 50 N.
422	WARRINGTON	Warrington Corporation	1900	F. V. L. Mathias	230, 460 D.C. 220, 380 A.C.*	Direct, & 50~, 3-ph.*	2,150	1,220	800 A.H.	£90,000	2,908 KW. (inc. mtrs.)	32 arc, 53 cbn
423	WATFORD	Watford Urban District Council	1899	F. W. Purse	200	50~, 1-ph.	1,130	577	56 KW. for 2 h.	£88,520	1,405 KW.	18arc, 2170cn., 100mtl. (appro
424	WEDNESBURY	Wednesbury Corporation	1904	W. Fennell	230 & 460	Direct	520	180	75 KW. for 3 h.	£20,000 (approx.)	941 KW.	..
425	WELLINGBOROUGH	County of Northampton El. Power & Traction Co., Ltd.	1903	Wm. J. S. Jones	230 & 460	Direct	300	175	70 KW.	..	168 KW.	261 inc., 6 Nernst
426	WEST BROMWICH	West Bromwich Corporation	1901	W. A. Jackson	230 & 460 tr. 500	Direct	1,550	1,056	175 KW.	£73,000 (approx.)	759 KW.	81 arc, 160 mtl
427	WEST HAM	West Ham Corporation	1899	..	100 to 500 D.C.*	50~, 1 & 2-ph., & direct	11,400	6,100	400 KW.	£435,000 (approx.)	3,583 KW.	361arc, 251mtl
428	WEST HARTLEPOOL	West Hartlepool Corporation	1901	H. F. Friederichs	230 & 460	Direct	1,600	945	69 KW.	£95,367	1,897 KW.	39 arc, 23 mtl.
429	WESTON-SUPER-MARE	Weston-super-Mare & District Electric Supply Co., Ltd.	1901	G. Charlton	230 & 460	Direct	1,100	442	100 KW.	..	700 KW.	..
430	WEYBRIDGE	Urban Electric Supply Co., Ltd.	1902	Herbert W. Watts	240 & 480	Direct	580	401	45 KW.	£74,095	802 KW.	..
431	WEYMOUTH & MELCOMBE REGIS	Weymouth Corporation	1904	Jas. H. Bolam	230 & 460	Direct	694	325	130 KW.	£51,285	666 KW.	48 arc + 96 cbn., 582 mtl.
432	WHITBY	Whitby Urban District Council	1902	L. H. King	230 & 460	Direct	400	133	23 KW.	£38,400	371 KW.	31 arc, 314 inc. 121 Nernst
433	WHITCHURCH AND PANCBOURNE	Whitchurch and Pangbourne Electric Supply Co., Ltd.	1903	D. H. Coorubs	240 & 480	Direct	108	80	30 KW.	£6,050	100 KW.	..
434	WHITEHAVEN	Whitehaven Corporation	1893	B. Sankey	210, 420, & 440	Direct	386	230	105 KW.	£43,467	500 KW.	9 arc, 500 inc.
435	WICAN	Wigan Corporation	1900	J. Slevin	230 & 460 tr. 550	Direct	1,960	1,805	675 A.H.	£131,780	1,291 KW.	22 arc, 12 inc. 3 N., 6 mtl.
436	WILLESDEN	Willesden Urban District Council	1903	J. G. Bruce	240 & 480	Direct	900	1,358	97 KW.	£181,605	2,578 KW.	205 arc, 200 inc.
437	WIMBLEDON & MERTON	Wimbledon Corporation	1899	H. Tomlinson-Lee	220	50~, 1-ph.	2,685	1,507	..	£198,565	4,725 KW.	89 arc, 1,110 mtl.
438	WINCHESTER	Winchester Electric Light & Power Co., Ltd.	1898	H. N. Warburton	210 & 420	Direct	850	443	85 KW.	£89,940	1,656 KW.	..
439	WINDERMERE AND AMBLESIDE	Windermere & District Electricity Supply Co., Ltd.	1893	C. Walker (Man.)	160 & 200	100~, 1-ph.	275	134	..	£43,316	483 KW.	129 cbn. ..
440	WINDSOR & ETON	Windsor Electrical Installation Co., Ltd.	1896	A. E. Farrow	110 & 220	Direct & 50~, 1-ph.	530 D.C., 100 A.C.*	525	130 KW.	£84,769	1,289 KW.	Eton, 12 arc, 58 × 2 mtl.
441	WISHAW	Wishaw Corporation	1905	Ernest F. Cox	240 & 480	Direct	200	181	..	£21,397	543 KW.	48 arc, 116 × 2 mtl.
442	WITNEY	Witney Electric Supply Co., Ltd.	1900	F. G. Curel	220	Direct	120	80	15.4 KW.	£10,518	150 KW.	..
443	WOKING	Woking Electric Supply Co., Ltd.	1890	J. G. McLean	200	100~, 1-ph.	1,175	509	..	£116,550	..	..
444	WOLVERHAMPTON	Wolverhampton Corporation	1895	C. E. C. Shawfield	220 & 440 D.C. 230, 400 A.C.*	Direct & 50~, 3-ph.	5,280	3,660	385 KW. & 350 KW	..	2,586 KW.	62 arc, 193 inc. 193 N.
445	WORCESTER	Worcester Corporation	1894	C. M. Shaw	100, 200 A.C. 230, 460 D.C.	100~, 1-ph., & direct	2,286	954	150 KW.	£145,410	1,443 KW.	60 arc, 85 × 2 cbn.
446	WORKSOP	Worksop Urban District Council	1901	J. Percival Crowther	220 & 440	Direct	540	266	92 KW.	£27,822	518 KW.	35 arc, 133 cbn.
447	WORMIT	Tayside Electric & Gas Light Co., Ltd.	1898	E. A. Stewart	230	Direct	45	..	..	..	45 KW.	..
448	WORTHING	Worthing Corporation	1901	G. Porter	230 & 460	Direct	538	347	69 KW.	£56,801	942 KW.	115 arc, 2 cbn., 34 mtl.
449	WREXHAM	Wrexham Corporation	1901	W. G. Pickvance	230 & 460 tr. 500	Direct	735	380 lg., 200 tr.	..	£38,975	722 KW.	42 arc, 37 cbn., 100 mtl., 25 N.
450	YARMOUTH	Yarmouth Corporation	1895	G. Bryant	100 & 200 tr. 500	83~, 1-ph.	735	382	..	£95,000	902 KW.	181 arc, 100 mtl.
451	YORK	York Corporation	1900	J. W. Hame	230 & 460	Direct	1,860	1,002	400 KW.	£125,598	2,016 KW.	108 arc, 35 mtl.

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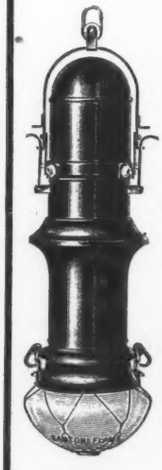

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940	763 KW.	53 arc, 307 inc., 150 Nernst	6=15 H.P. ..	..	831.5 KW.	..	Lg. 7 & 3; pb. lg. arc £20, inc. £2½ p.a.; pr. 2½	Max. demand and flat rate	..	.. ..	406
500	101 KW.	..	4=7 H.P. ..	..	108.7 KW.	15.4	Lg. 4½ ; pr. 3 ; htg. 1½	Flat rate .. .	28,345	*Resident eng., F. Howlett. Data to 1908, ...	407
362 (8) 500	174 KW.	103 arc ..	23=101½ H.P.	..	298.5 KW.	..	Lg. 7 & 2, or 5 ; pb. lg. £16 per lp. p.a. ; pr. 4 & 1, or 3 & 1	Max. demand, flat rate & time switch	168,781	*Resident eng., J. Wilson. Data to Mar. 31, 1909 ..	408
	..	..	..	..	..	..	Lg. 4 & 1½ ; pr. 1½ & ½	Max. demand ..	3,601,785	Bulk supply to Sale U.D.C. *Extension of 1,000 KW. in progress. Data to Mar. 31, 1908	409
	..	25 flame arcs	..	..	..	..	.. ..	..	..	Electricity supplied by Rother Vale Collieries, Ltd. Data to April 30, 1909	410
82?	1,951 KW.	79 arc, 157 cbn., 69 mtl.	39=82 H.P.	..	2,137 KW.	3.2	Lg. 6 & 3, or 4½ ; pb. lg. 1.93 ; pr. 2½ to 1½	Max. demand, flat rate & 2 rate mtr.	899,733	*H. Boot, Cons. Engr. Data to Mar. 1908	411
149	2,491 KW.	..	64=323 H.P.	..	2,814 KW.	11.4	Lg. 7 & 3, or 5½ w. free lamps ; pr. 4 & 1½, or 2½	Max. demand, flat rate & 2-rate meter	880,788	*Also S. Margarets o/T., Hampton Wick, Hampton Ct. and E. Molesey Data to Dec., 1908	412
404	1,107.4 KW.	24 arc, 8 cbn., 35 mtl., 89 N.	119=1,493 H.P.	27 cars ..	2,486 KW. (ex. tr.)	14.8	Lg. 5 & 2, or 4½† ; pr. 2½ & 1½, or 1½ & spl. ; tr. 1½ to 1(T side, 1½)	Max. demand and flat rate	1,454,086	Lg. & tr. *Bulk supply, 1,000 KW., from Carville. †Pb. lg., arc £16 & £13 ; N. £2, p.a. Data to Mar. 25, 1908	413
360	870 KW.	1 arc, 54 mtl.	49=360 K.W.	..	1,230 KW.	10.6	Lg. 7 (rural), 5 (urban) ; pb. lg. £2/5/6 per lp. p.a. ; pr. 3 & ¾, or 2½	Max. demand and flat rate ..	392,111	Output reduced owing to large user ceasing operations. Data to Dec. 31, 1908	414
610	550 KW.	117 cbn., 2 mtl., 35 Nernst	35=70 H.P.	..	695 KW.	2	Lg. 7 & 4, or 6 ; pr. 4 & 1½, or 2½	Max. demand, flat rate & contract	235,416	Data to Dec., 1908	415
581	..	64 arc, 93 mtl.	163=1,261 H.P.	..	2,455 KW.	..	Lg. 4 (ch. 3), pb. lg. arc £19½, inc. £2 p.a. ; pr. 1½ to 1 (hoists, 2)*	Flat rate	1,082,037	*Electricity for domestic purposes, 1d. p.u. Data to Mar. 31, 1909	416
561	1,945 KW.	60 arc, 120 inc.	51=294 H.P.	See other Table	2,190 KW.	11.1	Lg. 4 to 3 ; pb. lg. arc £20 p.a. ; pr. 2 ; tr. 1⅛	Sliding scale and flat rate	1,949,126	Lighting and traction	417
131	1,406 KW.	19 arc, 10 mtl., 12 N.	455 KW. ..	36cars=512KW	2,385 KW.	..	Lg. 6 & 2, or 4; pb. lg. £488 p.a. ; pr. 2 to 1½ ; tr. 1½	Max.dem.&flat rate w. dis. to lge. cons.	1,511,277	Lighting and traction. Data to Dec. 31, 1908	418
000	1324.6 KW.	89 arc, 460 inc., 8 Nernst	300 H.P. ..	See other Table	1,743 KW. (ex. tr.)	..	Lg. 4 w. dis. ; pb. lg. 3 & 2 ; pr. 1½ to 2½	Flat rate	..	Lighting and traction. Gas power..	419
	145 KW.	1 arc, 105 mtl.	2=6 H.P. ..	1=15 H.P.	157.5 KW.	18	Lg. 6 ; pb. lg. arc £12, inc. £2/17/6 p.a.	Flat rate	60,900	Lighting and traction. Data to Mar. 25, 1909	420
959	715 KW.	4 × 2 mtl., 50 N.	12=40 H.P.	..	776 KW.	13	Lg. 7 & 3, or 5½ ; pb. lg. 2 mtl., £3 p.a. (N. free) ; pr. 4 & 1½, or 2½	Max. demand and flat rate	225,105	Energy transmitted from Weybridge to Walton at 2,500 V. D.C. Data to Dec. 31, 1908	421
000	2,908 KW. (inc. mtrs.)	32 arc, 53 cbn.	..	42=798 H.P.	3,650 KW.	12	Lg. 6 & 2, or 4 (ch. 3½) ; pb. lg. £620 p.a.; pr. 2 & 1 ; tr. 1½. No mtr. rent	Max. dem., flat w. dis., pr. sl. scale	2,573,632	Lighting and traction. *220 volts 1-ph., 380 v. 3-ph.; tr. 500 V. D.C. Data to Mar. 31, 1909	422
320	1,405 KW.	18arc, 2170cn.,* 100mtl. (apprx)	110=420 H.P.	..	1,799 KW.	20.7	Lg. 7 & 3, or 5 ; pb. lg. 3 ; pr. 2 to 1	Max. dem., flat, sl. scale & 2-rate w.t.sw.	958,000 (estd.)	*Total equivalent 32-watt lamps. Data to Mar. 31, 1909	423
00 (0r.)	341 KW.	..	426 KW. ..	..	767 KW.	85	Lg. 6 & 1½, or 4 (½d. discount) ; pr. 1½ to ¾	Max. demand, flat rate & 2-rate meter	238,708	System changed over during year from bulk purchase to self-generating with Mond gas. Data for 1908	424
	168 KW.	261 inc., 6 Nernst	21=150 H.P.	..	375 KW.	..	Lg. 7 & 2½ ; pb. lg. 2½ ; pr. 2½ & 3½ (2-rate, 1 & 3)	Max.dem.,flat,2-rate w.t. sw. & contract	183,000	Data to Dec. 31, 1908	425
000 (0x.)	759 KW.	81 arc, 160 mtl.	142=1,300 H.P.	30=900 H.P.	2,358 KW.	18	Lg. 4½ & 1½, or 3½ ; pb. lg. 0.83* ; pr. 1½ to 0.75 ; tr. 2 to 1½	Max. demand, flat rate, sl. sc., & cont.	2,025,750	Lg. & tr. *Pb. lg. £15 p.a., 2 arcs to 11 p.m., 50-C.P. to dawn ; 32s., 2 25-C.P. mtl. 11 to dn. Data to Mar. 31 1909	426
000 (0x.)	3,583 KW.	361arc, 251mtl.	833=6,512 KW.	3,730 KW. ..	14,110 KW.	19	Lg. 3 ; pb. lg. 1.5 ; pr. 1 ; tr. 0.95	Flat rate, with dis., contract, special	15,522,035	*Lighting and traction ; also 50 to 6,000 V. A.C., & tr. 500 D.C. Data to Mar. 31, 1909	427
57	1,897 KW.	39 arc, 23 mtl.	211=1,756 H.P.	..	3,770 KW.	8	Lg. 4 & 3, or 6 & 2 m.d. ; pb. lg. 1½ ; pr 2 to ⅔ ; ckg. 1	Max. dem. & flat rate ; pr. sl. scale	1,977,787	Data to Mar. 31, 1909	428
	700 KW.	..	23=182 H.P.	24=480 H.P	1,194 KW.	13	Lg. 7 & 2, or 5 ; pr. 4½ & 1½, or 2½ ; tr. 2	Max. demand and flat rate	404,774	Lighting and traction. Data to Dec. 31, 1908	429
05	802 KW.	..	38=80 H.P.	..	935 KW.	9	Lg. 7 & 3, or 5½ (slot m., 7 incl.) ; pr. 4 & 1½, or 2½	Max. demand and flat rate	565,648	Energy transmitted to Walton at 2,500 V. D.C. Data to Dec. 31, 1908	430
85	666 KW.	48 arc + 96 cbn., 582 mtl.*	47=172 H.P. (Hts. 53 KW.)	..	903 KW.	14.5	Lg. 5 ; pr. 2½ w. dis. ; pb. lg. arc £15½, inc. £4, per post p.a.*	Flat rate with discounts	388,051	*Two cbn. lamps on arc posts ; 282 posts with 2 or 4 mtl. lamps=582 lamps. Data to Mar. 31, 1909	431
00	371 KW.	31 arc, 314 inc., 121 Nernst	23=102 H.P.	..	480.5 KW.	..	Lg. 4½ ; pb. lg. 3 ; pr. 2, 1½ & 1	Max. dem., flat rate, 2-rate mtr. & cont.	225,309	.. ..	432
50	100 KW.	..	1=6½ H.P.	..	104 KW.	..	Lg. 8 ; pr. 2, 3 & 4	Flat rate and contract with dis.	25,363	Data to D.c. 31, 1908	433
67	500 KW.	9 arc, 500 inc.	28=126 H.P.	..	634.5 KW.	4.3	Lg. 4½* ; pb. lg. 4 ; pr. 2 to 1, or 4½ & 1½ to 1 by 2-rate meter	Hopkinson, flat rate, sl. scale & 2-rate	282,280	*Or £8 per an. per KW. & 2d. per unit. Data to Mar. 31, 1907	434
80	1,291 KW.	22 arc, 12 inc., 3 N., 6 mtl.	210=1,731 H.P.	See other Table	2,629 KW.	..	Lg. 5, 4, 3 ; pb. lg. 3 ; pr. 1 ; htg. 2 ; tr. 1½	Flat rate	3,116,581	Lighting and traction	435
05	2,578 KW.	203 arc, 200 inc.	732 H.P.	..	3,223 KW.	15	Lg. 8 & 1, or 5 ; pb. lg. arc £13 4s. ; pr. 1½ to 0.58	Max. demand & flat rate	1,923,930	Bulk supply from North Met. E. P. S. Co. Data to Mar. 31, 1908	436
65	4,725 KW.	89 arc, 1,110 mtl.	84=705 H.P.	..	5,407 KW.	12.8	Lg. 4½ to 3½ ; pb. lg. ½ ; pr. 2 (above 2 H.P., 1½)	Sliding scale ..	2,343,289	Motors of 563 B.H.P. pumping sewage. Data to Mar. 31, 1909	437
40	1,653 KW.	..	69=103 H.P.	..	1,888 KW.	4	Lg. 7, 4, & 2 ; pr. 4 & 1½.. ..	Max. demand, flat rate & contract	519,585	Data to Dec 31, 1908	438
16	483 KW.	129 cbn. ..	16=23 H.P.	..	493 KW.	..	Lg. 7 ; pb. lg. 3 ; pr. 3½.. ..	Flat rate	134,071	Data to Dec. 31, 1908	439
69	1,289 KW.	Eton, 12 arc, 53 × 2 mtl.	70=221 KW.	..	1,503 KW.	..	Lg. 6 w. dis. ; pr. £3 p.a. per H.P. & 1d. p.u. ; htr. 3 w. di-.†	Flat rate w. discount & Hopkinson	646,504	*Adtn'l blk 'ply from Slough & Datchet Co. †Pb. lg. arc £22, £16 ; twin tant. £4⅜ p.a. Data to Dec. 31, 1908	440
97	543 KW.	48 arc, 116 × 2 mtl.	95=300 H.P.	..	850 KW.	Decrease	Lg. 4 ; pb. lg. £950 p.a. ; pr. 3 to 1	Flat rate	235,440	Total lamps connected decreased ; also sales for lighting decreased owing to mtl. fil. lamps. Data for 1908	441
18	150 KW.	..	5=26 H.P.	..	170 KW.	5	Lg. 6 & 5 ; pr. 2½..	Flat rate	46,725	Gas power. Data for 1908	442
50	..	..	14=50 H.P.	..	1,700 KW.	..	Lg. 6½ ; pr. 4 & 2 ; htg. 2 ..	Flat rate	619,813	Bulk supply at 2,000 volts to L. & S. W. Ry. Co. Data to Dec. 31, 1908	443
	2,586 KW.	62 arc, 193 inc. 193 N.	330=3,388 H.P.	..	8,169 KW.	50	Lg. 5 & 2, or 4 ; pb. lg. arc £20 p.a.† ; pr. 2 & ⅔, or 1 to ⅔ ; tr. 1½	Various methods..	..	Lighting and traction. *Tr. 500 v. †Pb. lg., inc. £2½ per lp. p.a. Data to Mar. 31, 1909	444
10	1,443 KW.	60 arc, 85×2 cbn.	143=825 H.P. 31 radrs.	30=750 H.P.	2,720 KW.	..	Lg. 6½ & 3, or 4½ (shops 5) ; pr. 2½ & 1 (rest. hrs. 1) ; tr. 2 to 1½	Max. demand, flat rate & sl. scale	1,545,772	Lighting and traction ; old station A.C., new one D.C. Data to Mar. 31, 1909	445
22	518 KW.	35 arc, 136 cbn.	32=156 H.P.	..	704.5 KW.	27.9	Lg. 4 ; pb. lg. 2½ ; pr. 1½ ..	Flat rate with discounts	329,071	Data to Mar. 31, 1908	446
	45 KW.	..	..	..	45 KW.	..	Lg. 5	Flat rate	15,000	Suction-gas plant. Data to 1908	447
01	942 KW.	115 arc, 2 cbn., 34 mtl.	33=106 H.P.	..	1,006 KW.	23	Lg. 5 & 4½ ; pb. lg. 5 ; pr. 1½ ..	Flat rate with discounts	483,667	Data to Mar. 31, 1908	448
75	722 KW.	43 arc, 37 cbn., 100 mtl., 25 N.	33=112 H.P.	20=500 H.P.	1,286 KW.	19	Lg. 5, or 5 & 2½ (½ dis.), outside arc 3* ; pr. 2½ to 1⅛ (⅛ dis.) ; tr. 2½ to 1	Flat rate & sliding scale	525,194	Lg. & tr. †Also 12½% on net ast. & 1d. p.u. Pb. lg. arc £20, £15, N. £4½., inc. £3 3s. & £2½. Data to Mar. 31, 1909	449
00	902 KW.	181 arc, 100 mtl.	33=70 H.P....	..	..	..	Lg. 5, less 5%; pb. lg. arc, £16 p.a. ; pr. 2½ A.C., 2 D.C.	Max. dem., flat rate w. dis., cont., t. sw.	1,513,937	Lighting and traction. Data to Mar. 31, 1908 . ..	450
98	2,016 KW.	108 arc, 35 mtl.	178=1,108 H.P	..	2,776 KW.	13	Lg. 7 & 1½, or 4½ to 3½, ch., &c., 3 ; pr. 1½ to 1*	Max. dem., flat, 2-rate meter, & contract	1,342,008	*Pb. lg. arc (open) £17, (enc.) per pair £12 12/0 ; inc., £2 17s. p.a. Data to Mar. 31, 1909	451

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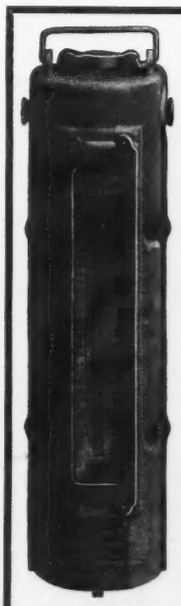

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switches at once break the circuit, but unless the pilot switch on the machine is turned off, there is the danger of the machine starting up again when the supply is restored. To obviate this difficulty Mr. Broadbent designed a special pilot, or "inching," switch for Messrs. Cassell's installation, and this is shown (marked A) in the illustration, fig. 6. This switch is contained in a small cast-iron box about 4 in. square, fixed close to the position of the "layer-on." By means of a small projecting handle below the switch, the operator can start and stop and inch the machine at will; but in the event of the machine stopping, due to any discontinuity of supply, it will not start again automatically when the supply is restored, as the inching switch is always normally in the "off" position. The system, therefore, is absolutely safe.

The switch lettered B in this illustration is fixed near the taking-off board, the machine being what is known as a "perfecter," printing on both sides of the paper. It is necessary, or, at any rate, a great convenience, for the taker-off to be able to stop the machine, and this he can do by means of the small tumbler switch B. This breaks the solenoid circuit and drops the switch, but for the reasons given above the machine will not start again when the switch is closed until the layer-on himself actually starts it by means of the little switch A. On the other hand, the layer-on cannot start the machine if the switch B is off. The starter and speed controller are visible on the pillar.

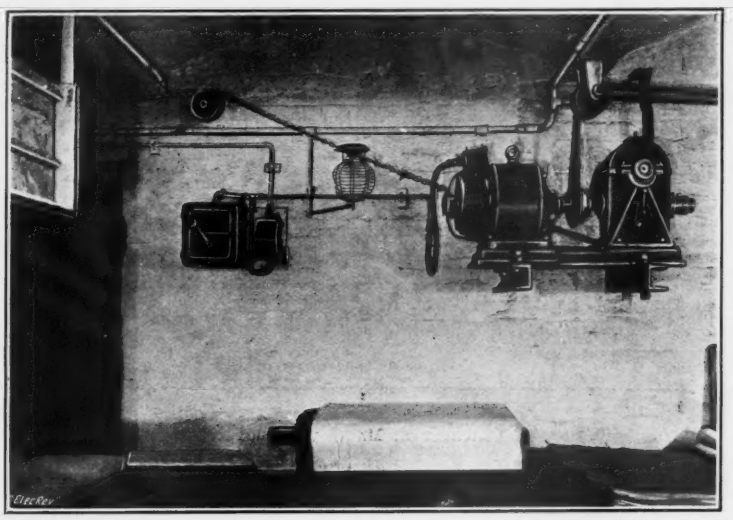


FIG. 8.—WORM-GEARED MOTOR MOUNTED ON CHANNEL-IRON BRACKETS.

Fig. 7 shows the driving side of this machine—in fact, it shows two similar machines with their motors, the latter being spur geared to the driving shaft. There is generally a little motion on these shafts, and new bearings were put in to stiffen them, so that the spur gearing should run well. One of the gear cases has been removed to show the gearing. It will be observed from this illustration that there are no exposed cables, the finishing lengths being enclosed in flexible metallic tubing sweated to nipples attached to the terminal box on top of the motor and to the last length of screwed conduit. Mr. Broadbent was among the first to specify this method for piping installations, and it is his invariable practice. On these machines are printed the "People's Library" and the well-known Cassell's Railway Guide, &c.

Fig. 8 shows a special drive, consisting of a motor with self-contained worm gear mounted high up on girder brackets. This motor performs two functions — namely, it drives an exhaust fan by means of a rope running over jockey pulleys from a V-pulley on the motor shaft, and, in addition, it drives by means of a cam on the slow-motion shaft

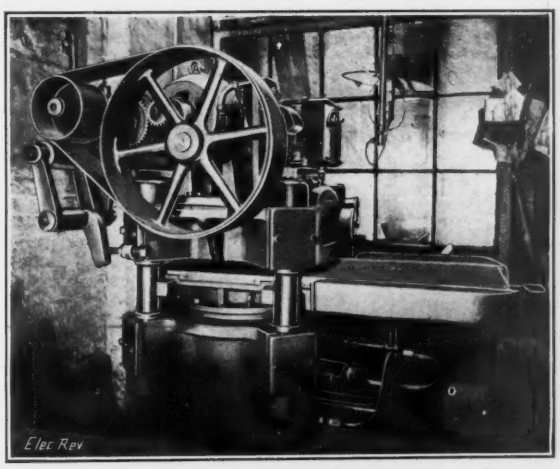


FIG. 9.—TOGGLE PRESS IN BLACK SHOP.

a sprinkler for damping paper. The sprinkler tank is shown suspended from the roof on the left of the illustration, the valve being operated by the chain running over jockey pulleys on the ceiling, and terminating at the end of a swinging bar, which is seen behind the motor. Each time the cam comes round it actuates this bar, lifting the valve and sprinkling the paper beneath. These were, of course, existing arrangements, and the motor had to be arranged to meet the old conditions of working. It will be interesting to learn that the sprinkler and fan were originally driven through about ten intermediate shafts and belts from the main engine, in addition to a long length of chain and rod running over jockey pulleys.

This illustration also serves to show the methods of wiring, from which it will be seen that the whole of the wires are enclosed in steel pipes, the finishing pieces being in flexible metallic tubing, as in the previous illustration.

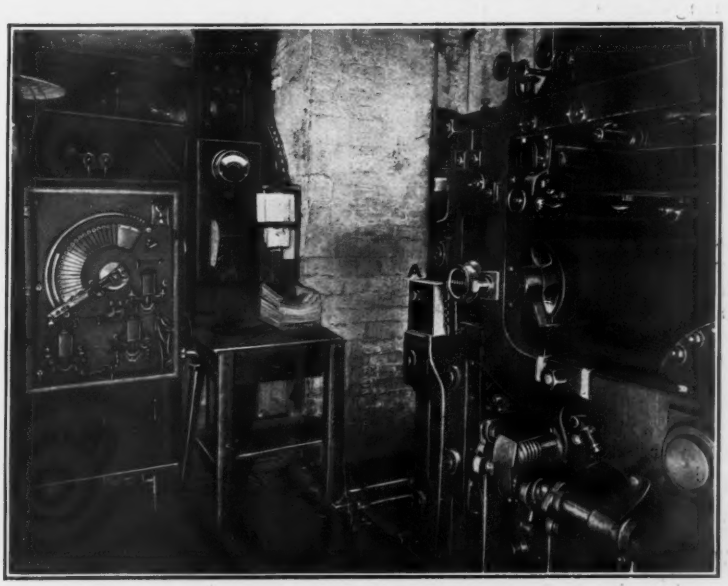
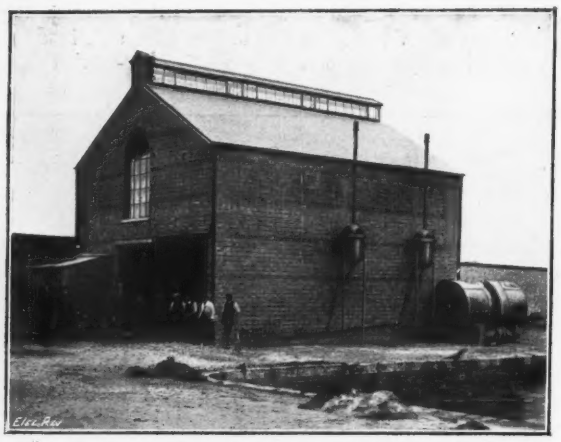


FIG. 10.—ROTARY PRESS, AND ELECTRIC CONTROL GEAR (OPEN).



CHICHESTER ELECTRICITY WORKS—EXTERIOR.

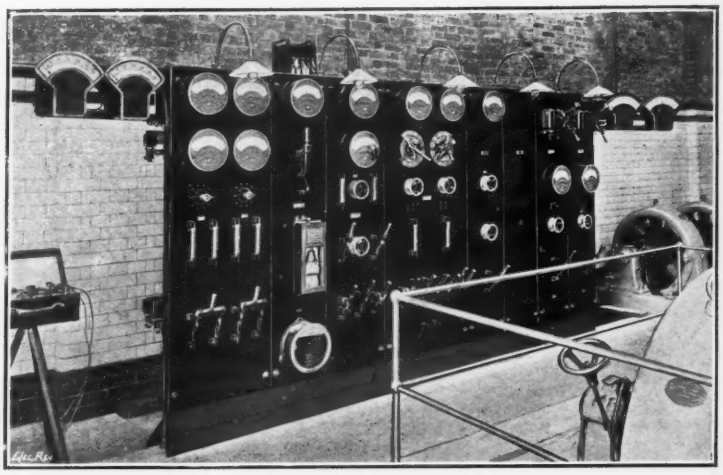
Fig. 9 shows a self-contained equipment of a toggle press in the black shop, driven by a spur-geared motor mounted on the top of the machine. The D.P. switch and starter are mounted on the front of the machine within reach of the operator. Those who are familiar with the black shop of a printing office will know the conditions under which a machine like this has to work.

Fig. 10 shows the end of a rotary press together with the electric control gear, of which the door is opened to show the details. The D.P. switch shown below the ammeter is fed from one of the distributing boxes, and in turn leads through the ammeter to the "Openshaw" control panel on the left. The operation is as follows:—On moving the starting handle, the main solenoid switch, one of the three shown on the panel, is excited, closing the main circuit through all the resistance. The starting handle is moved up one or two steps until the press commences to move. As soon as it moves, the voltage across the armature excites a diverter solenoid which pulls up and throws a resistance across the armature, thus holding the machine on its speed and preventing it accelerating. Further movements of the rheostat arm vary the resistance, and at a certain point the diverter solenoid is de-energised and drops, breaking the diverter circuit; the machine accelerates as further steps of series resistance are cut out, the final control being on the shunt. The variation usually required in the running speeds of a rotary press is comparatively small, but it is essential to be able to get the crawling or creeping speeds, which approximate to about 5 per cent. of the normal running speeds. Whilst the press is running at this speed the attendants are threading the paper through the rolls, and it is of the utmost importance that the machine should not accelerate while this is being done, but should maintain a perfectly constant speed. The small switch shown on the right-hand top corner of the panel is an inching switch, by means of which the press can be inched without touching the main rheostat lever. The function of this is to energise the inching solenoid shown on the left-hand bottom corner of the panel, which cuts out a certain amount of starting resistance. Several inching switches are placed on the press itself, and one of these is shown lettered A just alongside the revolution counter. This machine prints those popular Cassell's weeklies, *Chums*, the *Gardener*, the *Building World*, &c.

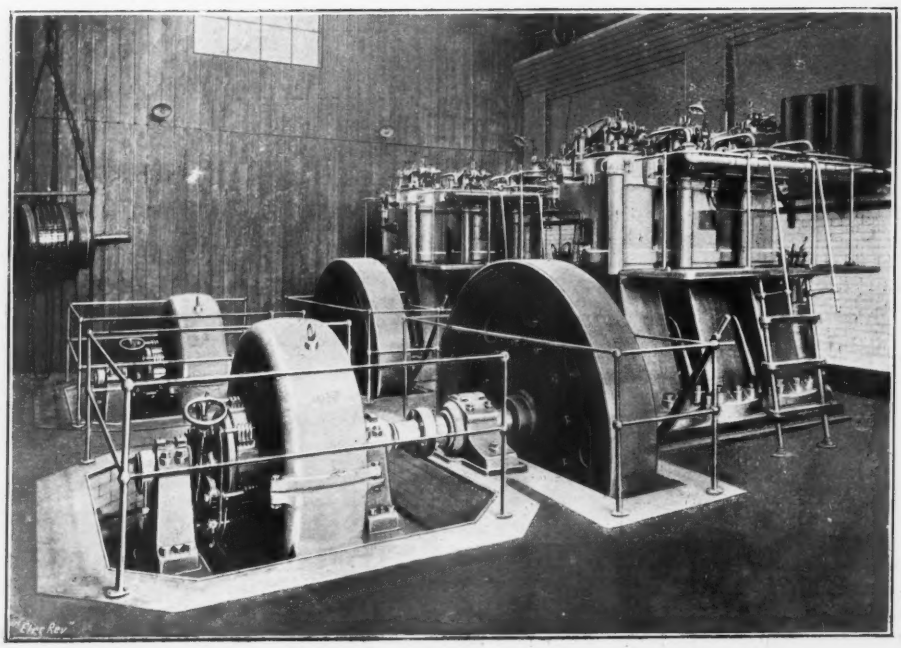
Throughout the works there are about 100 motors, ranging from a ½-H.P. motor on the roller-washing machine to 35 H.P. on a new rotary press on which *Work* and *Cassell's Saturday Journal*, with its two-colour wrapper, are printed and folded.

In addition to the motors for driving the machinery, there are also motors driving the dynamos for the electro-plating baths.

As was mentioned at the beginning of this article, the



CHICHESTER: MAIN SWITCHBOARD.



CHICHESTER: DIESEL ENGINES AND G.E. CO. GENERATORS.

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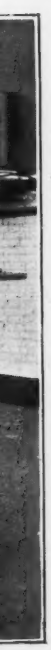
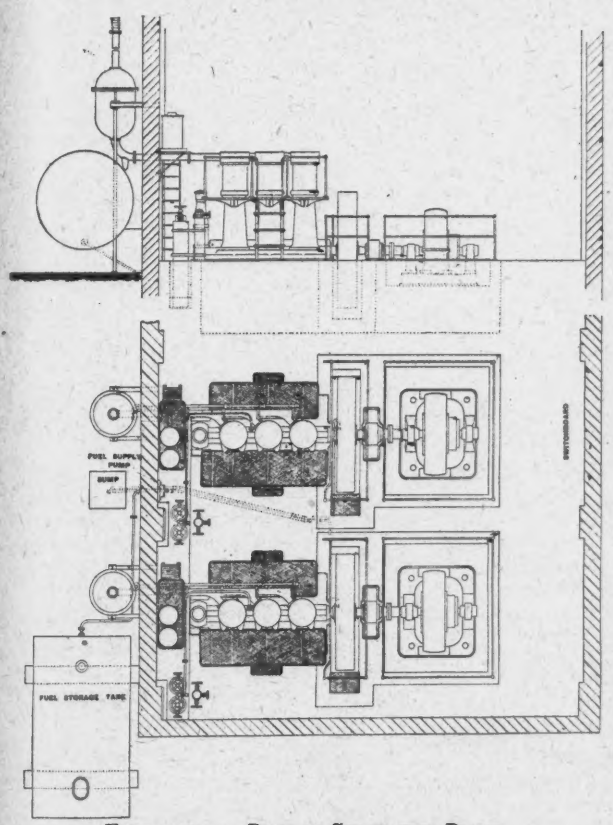


work has been carried out at various times and by various contractors, among those who supplied motor equipments, in addition to the firms already mentioned, being J. H. Holmes & Co., the Lancashire Dynamo and Motor Co., and Electromotors, Ltd., who carried out the contract for the main machine room.

We are indebted to Messrs. Cassell & Co., Ltd., for permission to take the photographs from which the blocks illustrating this article have been made, and to the consulting engineer, Mr. Frank Broadbent, M.I.E.E., for details of the work described, which has been carried out under his personal supervision.

CHICHESTER ELECTRICITY WORKS.

The installation of a central electric lighting station in a beautiful old town such as Chichester presents many interesting problems. The load will consist mainly of lighting supply, with its usual low load factor and high capital charges per unit generated; it is therefore very important that the capital outlay be kept down to the lowest possible figure, and that stand-by losses be reduced to the utmost;



Elevation and Plan of Generating Plant.

it is also necessary to avoid nuisance from smoke, noise and vibration, and to preserve the amenities of the district by dispensing as far as possible with such unsightly erections as tall chimneys, cooling towers, &c. To reduce the cost of mains and the electrical losses therein, the site of the works should be near the centre of the load, where land is comparatively dear, so that the plant should be as compact as possible. Almost all the foregoing considerations are opposed to the adoption of steam, and, though to a less degree, to that of producer gas.

On the Continent, where all classes of coal are high in price, large numbers of Diesel engines have been installed in central stations, owing to their economy at all loads and their ability to use cheap fuel oils. Even in this country, where coal is comparatively cheap, Diesel oil engines have been installed in 9 or 10 power stations for lighting and traction work; they possess special advantages for a lighting load, being entirely free from stand-by losses, and economical at light loads, while the simplicity of the plant as a whole, the convenience in transport of fuel, small operating staff, and other valuable features, render it very suitable for such a purpose. These and other considerations led Mr. Horace Boot, consulting engineer to the Chichester Electric Light and Power Co., Ltd., to decide upon adopting Diesel engines for his central station scheme.

Orders were placed with Messrs. Johnson & Phillips, Ltd., Charlton, for the complete installation of engines, dynamos, cables, &c., exclusive of the building. The latter, as shown in one of our illustrations, p. 1050, is of the simplest possible type, an advantage due entirely to the compactness and simplicity of the generating plant. It was erected to the designs of Mr. Boot, of red brick, with white glazed bricks for the facings, and a black and white terrazzo flooring. A five-ton crane is provided, made by Messrs. Morris & Bastert.

The plant consists of two three-cylinder Mirrlees-Diesel oil engines, direct-coupled to General Electric D.C. generators, each capable of developing 100 KW. at 500 volts when running at 250 R.P.M.; the dynamos are shunt-wound, but the yokes and poles are large enough to take compounding coils to raise the voltage to 550 for traction purposes if required at a later date.

The engines were designed and constructed by Messrs. Mirrlees, Bickerton & Day, Ltd., of Stockport; they operate on the well-known Diesel principle, with the four-stroke cycle, and are controlled by specially designed knife-edge governors mounted on the vertical shaft that drives the camshaft. The lubricating arrangements have been designed to provide for continuous running.

No "gumming up" of the piston and piston-rings takes place, and in consequence of this the pistons only require to be withdrawn for examination once every 12 or 15 months. The exhaust valves of all internal-combustion engines, however, require cleaning and grinding from time to time, owing to their deterioration by the passage of the hot exhaust gases over the valve faces; Messrs. Mirrlees, Bickerton & Day, Ltd., fit a specially designed split lever for operating the exhaust valve, and on withdrawing one small bolt, the half of the lever immediately above the valve can be swung back, thus enabling the exhaust valve to be withdrawn without dismantling any of the valve operating gear.

The engines are started by compressed air, which is stored in suitable receivers supplied with each engine. The operation of starting is so certain and simple that an engine can be started up and put on full load in two or three minutes. The storage receivers are re-charged by the two-stage air compressor, which is directly driven from the crankshaft; sufficient air for ten starts is provided for. A gun-metal circulating water pump, driven by spur gear from the engine shaft, derives its water supply from an adjoining canal. Each cylinder is fitted with a visible-outlet water pipe. About 600 gallons of water are passed through the jackets per hour when the engines are developing maximum load. A fuel storage tank, capable of holding sufficient oil to run both engines at full load for a week, night and day, is situated outside the engine house. After the oil has been delivered to the storage tank no further handling is required.

A balancer set has been provided, consisting of two 25-KW. shunt-wound machines coupled together on one bedplate.

The switchboard is one of Messrs. Johnson & Phillips's standard manufacture for controlling a three-wire D.C. network, and consists of enamelled slate mounted on an angle-iron framework. It is built to control three generators (one for extensions), the balancer, and two feeders, and is also equipped with a panel to register the total output, and a B. of T. panel. All the instruments are of the J. & P. moving-coil pattern.

The distribution is on the three-wire system, at a pressure of 440 volts across the outers, and the whole of the cables are of the J. & P. standard paper-insulated type. The feeder cable running to the Cross is a ·2 triple-concentric lead-covered cable drawn into a two-way Sykes conduit, and the pilot cable is a three-core steel tape armoured cable, laid direct in the ground.

The distributors are all of the three-core type, steel tape armoured, and laid direct in the ground. A marker board is laid over the cables to indicate their position.

The distributing network is controlled at the Cross by

means of a feeder pillar, the distributors supplying North Street, South Street, West Street and East Street all entering the pillar and being fed through switch-fuses.

Concentric armoured cables are used for house services, the house service boxes and fuse boxes being of the J. & P. standard type.

The supply was begun on the 3rd inst. with over 2,000 lamps connected, and several contracts for the supply of power have been made. To provide for extensions, space has been left for an additional engine and dynamo, and a temporary end to the engine-room has been fixed which can readily be removed when further extensions are necessary.

Mr. R. V. Weare has acted as clerk of the works during the construction, and has been appointed resident engineer, while Mr. Boot has been retained as consulting engineer to the company. We are indebted to Mr. Weare for the photographs here reproduced.

TRAMWAY and RAILWAY NOTES.

(*Continued from page* 1045.)

Cardiff.—The Corporation is considering a scheme for running rail-less cars between the city and Llandaff, and the electrical engineer (Mr. Arthur Ellis) has been asked to report upon the probable cost of installing the proposed service.

Clayton-le-Moors.—The U.D.C. has sealed a petition to the B. of T. supporting the revival of the Blackburn, Whalley and Padiham Light Railway scheme, and an extension of time for carrying out the work.

Continental Notes.—ITALY.—Plans are being prepared for the establishment of an electric tramway, about 17 miles long, from Masnago to Angera. A company is also about to be formed in Spezia, with a capital of 2,300,000 lire (£92,000), for the construction and working of an electric tramway designed to connect Spezia with Upper Lunigiana, terminating at Fivizzano. The last-mentioned company will be called the Società Anonima Elettro-Industriale della Valle del Rosario.

The company which works the electric tramways of Spezia has applied to the Italian Ministry of Public Works for powers to duplicate the track which runs from the main line near the railway station to the Corso Garibaldi.

The Terni Electric Tramways Co. has applied to the Italian Ministry of Public Works for powers to construct and work a section of electric tramway to join up the Terni-Collestatte line with the Penna Rossa shipbuilding yards.

SWITZERLAND.—Plans are being prepared in respect of a projected electric railway between Bonn, Siegburg and Honnef.

Falkirk.—It is expected that work in connection with the extension of the electric tramways from Falkirk to Laurieston, 1½ miles, will be commenced this week.

Glasgow.—At a meeting of the Tramways Committee last week an abstract of the statement of accounts for the year ending May 31st was submitted and approved of, subject to audit. The abstract, according to a Glasgow newspaper, shows the income for 1908-9 as £892,751, compared with £910,318 for 1907-8. The expenditure for the 12 months was £505,618, while for 1907-8 it was £509,894. The difference of £387,133 between the income and expenditure for 1908-9 was increased by £29,791 interest, thus bringing up the total balance over expenditure to £416,924, against £406,671. The sum of £416,924 has been allocated as follows:—Govan tramways, £5,075; Paisley tramways, £4,659; interest, £63,349; sinking fund, £71,232; income-tax, £10,445; common good, £50,000: depreciation, £195,798; balance, £16,275. At the end of the period 1907-8 the balance was £38,930. This year, in addition to increased amounts paid to the sinking fund, income-tax and interest, it is proposed to raise the common-good contribution from £35,000 to £50,000, and the depreciation from £188,603 to £195,798.

London.—The G.E. Railway is making considerable reductions in its suburban fares, in the hope of drawing back custom lured away by electric tramways.

At the Surbiton U.D.C. last week the Highways Committee reported that it had received counsel's opinion in regard to the appropriate remedy for the nuisance caused by the present noisy running of the tramcars, and recommended that, unless the nuisance was abated, the clerk be instructed to apply to the Attorney-General for permission to apply to the Courts for an injunction against the company. Sir Clifton Robinson had been informed of this recommendation. Mr. Parry said that somewhat similar action was being taken by neighbouring authorities, although Sir Clifton Robinson had told Twickenham that no other authorities had complained. He hoped the recommendation would go through. The discussion revealed a difference of opinion, and subsequently it was decided to send a deputation to the meeting at Teddington called to consider the increased speed of cars throughout the district.

The London United Tramways, Ltd., having applied to the B. of T. for an increase of the maximum speeds on certain portions of its lines, the B. of T. has sought the opinion of the authorities concerned. The Acton Council (says the *Daily News*), is not opposed to the maximum speed being increased from 10 to 16 miles outside the main business portion of Uxbridge Road, but considers it would be like issuing a death warrant to consent to an increase in the busy part of the town. Ealing T.C. disapproves of any increase.

The Heston and Isleworth U.D.C. has instructed the surveyor to make observations and submit a list of the tramcars which have lately been the cause of many complaints on account of the noise they cause. The U.D.C. has decided to oppose the application by the company for powers to run tramcars at higher rates of speed over portions of the line.

Nelson.—The T.C. on June 17th approved of the electricity estimates, and decided to discontinue the practice of paying the tramway profits to the credit of main roads.

The Tramways Committee has decided to adopt ½d. fares on the Scotland Road section.

The electric tramway manager of this town has been instructed to meet the Colne and Trawden Light Railway authorities, with a view to obtaining a through-running service over the respective lines of the company and the Corporation.

Portsmouth.—The suggestion has been made to the Corporation that a system of exchanges, or ½d. fares, should be introduced on the tramway system. The Tramways Committee has been making inquiries of other Councils owning electric tramways, and it is found that there is a general consensus of opinion against the ticket exchanges, as they conduce to fraud, and are a continual source of friction between the public and the tramway departments.

Tottenham.—The Metropolitan Electric Tramways has applied to the B. of T. for an extension of the time by two years for the completion of the works authorised by the Tottenham, Walthamstow Light Railways Order, 1906. The District Council is not opposing the proposed extension.

U.S.A.—Two electric tramcars, travelling in opposite directions at high speed, came into collision on Sunday evening at Chesterton, Indiana. Ten persons were killed, and injuries, in several cases eventually fatal, were sustained by 20 others.

Willesden.—The Metropolitan Electric Tramways has submitted plans in connection with the proposed joining-up of the County of Middlesex Light Railways with the L.C.C. tramway system in Scrubbs Lane. The company is to be informed that, before the scheme is approved, arrangements must be made with the L. and N.W. Railway Co. for widening the roadway, &c.

Representatives have been appointed to attend a conference of the L.C.C. with reference to the proposed construction of a tramway from the Marble Arch to Cricklewood.

TELEGRAPH and TELEPHONE NOTES.

All-Red Cable.—It is stated in the *Times* that the Canadian Pacific Railway, in the event of the laying of an Imperial Atlantic cable, will grant permission to use their right of way from East to West for a special land wire to serve as a connection between it and the Pacific cable.

Argentina.—According to the *Financier* the *National Zeitung* is considerably disturbed about the reported agreement between the Western Telegraph Co. and the Argentine Government for the laying of a cable from the Republic to Ascension. What is particularly objected to is the granting of conditions which give a preferential position to the Western, to the exclusion of other cable companies. The direct cable, when laid, will carry all the cable traffic from the Argentine Republic, which will not, as heretofore, pass over the Brazilian cables.

The Western Co. require a concession for 25 years to lay all cables between Argentina and other countries, and the Government seem inclined to grant such a concession as far as Europe is concerned. The agreement has still to be passed by Congress, and the Press attitude is that this cable policy is serious. Germany claims that the agreement would be an infringement of the most-favoured-nation treatment, and against the country's best interests.

London-Madrid Telephone.—It is reported in the *Daily Express* that by January 1st telephonic communication will be completed between London and Paris, Madrid, Barcelona and San Sebastian, with four lines. The distance from London to Madrid, *vid* Paris, is over 1,100 miles.

Pacific Cable Accounts.—In his address to the Imperial Press Conference, Lord Crewe made reference to the debit balance on the working of the Pacific cable, pointing out at the same time that even if this expenditure were constant, it was quite justified by the fact that the laying of this State-owned cable had brought about very considerable reductions in the rates which had been maintained on the so-called "pioneer lines" previous to the laying of this cable across the Pacific. The following figures, abstracted from the official accounts of the Pacific Cable Board, show in detail the amount which each of the Governments who are partners in this

work have to disburse. It will be seen that, generally speaking, this amount is a diminishing quantity. The accounts for the current year are not yet published.

Deficiency recoverable in the following proportions:—

	1908.
United Kingdom	5/18ths = £8,580
Canada	5/18ths = £8,580
New Zealand	2/18ths = £3,432
Queensland, New South Wales and Victoria, *each*...	2/18ths = £3,432

Year ending March.	Gross earning.	Terminable annuity (50 years).	Working expenses.	*Deficiency.*	*Add*—Reserve fund, inc. int. on same.	Bringing *apparent* deficiency to
Printed.	£	£	£	£	£	£
Aug., 1903 ..	19,579*	—	40,526	—	16,500†	—
July, 1904 ..	79,824	77,544	54,824	52,544	35,794	88,338
„ 1905 ..	87,806	77,544	50,751	40,989	35,140	76,129
„ 1906 ..	91,814	77,544	52,964	38,694	34,138	72,832
„ 1907 ..	113,000	77,544	57,895	22,439	33,516	55,955
„ 1908 ..	109,697	77,544	62,978	20,885	32,523	53,408

* Cable opened for traffic December 8th, 1902, about three months' return only.
† Including purchase of Stock Cable = £11,209 15s.

Thus we see that, taking this "*deficiency*" figure, which *includes* working expenses, and the 50 years terminable annuity, amounting to £77,544 per annum, but which *excludes* an additional reserve fund, with interest thereon, amounting so far to about £33,000 per annum, we find that for last year Great Britain's proportion of guarantee cost her the sum of £8,580 on the Pacific Cable account. It is worth noting that while on telegrams reaching Great Britain from Australia the Post Office here charges no "terminal tax" whatever, but only the equivalent of the ordinary inland rate of one halfpenny per word, the amount charged by the Commonwealth as "terminal tax" is fivepence on every word reaching Australia from Great Britain, while the inland rate for telegrams throughout Australia is only one penny per word.

Telegraphic Interruptions:—

Jamaica-Colon	... May 6, 1909
Dakar-Conakry	... May 13, 1909
Tangier-Cadiz	... May 19, 1909
Cayenne-Salinas	... June 7, 1909
Paramaribo-Cayenne	... June 8, 1909
Rome-Constantinople...	... June 14, 1909
Trinidad-Demerara	... June 19, 1909

CONTRACTS OPEN and CLOSED.

OPEN.

Acton.—July 12th. Lead-covered paper-insulated cables for the U.D.C. See "Official Notices" June 18th.

Australia.—MELBOURNE.—July 14th. One direct-current steam-driven generating set of 1,000, 1,250 or 1,500 KW., for the Council. See "Official Notices" May 14th.

MELBOURNE.—August 4th. Overhead travelling crane, for the Electricity Supply Committee. See "Official Notices" June 4th.

MELBOURNE.—August 4th. Overhead travelling crane for the Council. See "Official Notices" June 11th.

MELBOURNE.—July 7th. 18 transformers for the City Council. See "Official Notices" June 18th.

MELBOURNE.—July 7th. 80 A.C. flame arc lamps for the Council. See "Official Notices" to-day.

Austria.—VIENNA.—June 30th. Tenders are required for the annual supply of telegraph material for all the main stations on the Austrian State Railways. Particulars may be obtained from the Director, at Vienna.

Barnstaple.—Installation of electric lighting at the Union Workhouse. Clerk, W. H. Toller, Boutport Street; Master, F. W. Watts, Alexandra Road.

Bedford.—June 26th. One 30 ft. × 8 ft. Lancashire boiler, with pipe work and superheater, for the Corporation. See "Official Notices" June 11th.

Belfast.—Feeder panels for lighting switchboard in the Corporation electricity supply works. See "Official Notices" June 11th.

Belgium.—June 30th. The Société Nationale des Chemins de Fer Vicinaux, of Brussels (14 Rue de la Science) is inviting tenders for the contract for the overhead electrical equipment and the electrical connections to the rails in connection with the Scheut-Dilbeek section of the Brussels-Schepdael-Ninove local electric railway.

July 14th. The Société Nationale de Chemins de Fer Vicinaux requires tenders for the plant and complete equipment of a sub-station for transforming alternating current into direct current for electric traction on the line from Spa to Verviers. Particulars are obtainable at the office of the company, 14, Rue de la Science, for 10d.

Birmingham.—June 30th. Engineering stores and electrical accessories for the electricity supply department.

Bristol.—June 28th. Cables and fittings, &c., for the electric lighting at Portishead Dock for the Docks Committee of the Council. Specification (deposit £3) from Mr. W. W. Squire, engineer, Cumberland Road, Bristol.

Burslem.—June 29th. One 600-KW. steam dynamo or turbo-generator; condensing plant, water-tube boiler, and switchgear, for the Corporation. See "Official Notices" June 11th.

Exminster.—June 30th. Electrical appliances for a year for the Devon County Lunatic Asylum. H. E. Morgan, Clerk.

Gillingham.—June 28th. Coal for the Council's Electricity Department. See "Official Notices" June 11th.

Gravesend.—July 3rd. Automatic stoker for the Electricity Committee. See "Official Notices" June 11th.

Hornsey.—Electric light installation for the North Harringay Schools, for the B.C. A reference to this matter appears in our "Business Notes" to-day.

Italy.—VENICE.—July 10th. The Director-General of the Arsenal of Marine requires tenders for two lots of electric lamps and carriers estimated at £1,032. A deposit of 10 per cent. is required.

London.—ST. PANCRAS.—July 10th. Arc lamp carbons for the B.C. See "Official Notices" April 30th.

GREENWICH.—July 8th. Equipment of electric lifts at Vanbrugh Hill Infirmary, for the B.G. Samuel Saw, Clerk, Woolwich Road, Greenwich.

LEWISHAM.—June 29th. Telephone installation at the workhouse and infirmary, for the B.G. Union Offices, 394, High Street, Lewisham.

Norway.—CHRISTIANIA.—July 2nd. Norwegian State Railways. 28,800 pairs of carbon points of various dimensions. Tenders marked "Anbud paa Kulspidser," to Styrelsens Expeditions Kontor. Copies of conditions and specification may be seen at the Commercial Intelligence Branch of the Board of Trade, 73, Basinghall Street, London, E.C. In all Norwegian Government contracts preference of from 10 to 15 per cent. (apart from Customs duties) is given to Norwegian manufacturers, and it is obligatory that a resident agent (not necessarily a Norwegian firm) should act for tenderers not residing in Norway.

Pontypridd.—July 12th. Condensing plant, circulating pump, air pumps, pipe work, &c., for the U.D.C. electricity department. See "Official Notices" to-day.

Rotherham.—June 28th and July 13th. Cable and meters for the Electricity Department. See two "Official Notices" June 18th.

Spain.—OLOT (PROVINCE OF GERONA).—The municipal authorities have recently invited tenders for the concession for the electric lighting of the town during a period of 12 years.

Stevenage.—The U.D.C. is prepared to receive applications from companies or persons willing to carry out its provisional order. See "Official Notices" June 11th.

Swansea.—July 7th and 14th. Arc lamps, resistances, choking coils, &c.; cables; arc lamp pillars, brackets and gear; arc lamp feeder pillars, joint boxes, &c., for the Corporation Electricity Department. See "Official Notices" to-day.

July 1st. Electric light wiring, fittings, &c., for the new Technical College buildings, for the T.C. (deposit £2 2s.); borough electrical engineer.

Wallasey.—July 12th. Battery, reversible booster and switchboard for the U.D.C. See "Official Notices" to-day.

Whitehaven.—July 20th. Lighting the Harbour Quays for five years, by electricity, gas, or other means, for the Harbour Commissioners. See "Official Notices" June 11th.

Worksop.—June 29th. Underground cables for the U.D.C. See "Official Notices" June 18th.

CLOSED.

Atherton.—The Electricity Committee has accepted the tender of Messrs. Callender's Cable Co. for 740 yds. of H.T. cable.

Belfast.—Messrs. Noble's tender for 14,000 tons, and Mr. John Kelly's for 6,000 tons, of coal for the Tramways and Electrical Committee are recommended for acceptance.

Dorking.—Messrs. Heenan & Froude are supplying a dust and house refuse destructor for the Dorking U.D.C., at £5,295.

Greenock.—The Corporation has given a contract for electricity meters to the Bastian Meter Co., Ltd.

Grimsby.—The T.C. has accepted the tender of Messrs. Hebb & Co. for a cooling tower, at £140; and that of Messrs. McPhail & Simpson, Ltd., for superheaters, at £255.

Colchester.—By courtesy of the Asylums Committee and the consulting engineers (Messrs. Hawtayne & Zeden), we are enabled to publish the following list of tenders for electrical work at the new second County Asylum, Colchester, for the Essex County Council:—

CONTRACT No. 1.—*Two Steam Dynamos (100 kw.), Steam Balancer (two 50-kw.), Motor Balancer (14 kw.), Switchboard and Travelling Crane.*

Crompton & Co.	£2,751	Phœnix Dynamo Co.	£3,080
Phœnix Dynamo Mfg. Co.	2,759	Crompton & Co.	3,082
do. do.	2,779	do.	3,084
do. do.	2,789	do.	3,086
Crompton & Co.	2,804	Union Electric Co.	3,090
Phœnix Dynamo Mfg. Co.	2,809	Bruce Peebles & Co.	3,092
Crompton & Co.	2,824	Crompton & Co.	3,105
B.T.-H. Co.	2,831	General Electric Co.	3,114
do.	2,841	Lancs. Dyn. & Motor Co.	3,128
Crompton & Co.	2,843	Morley Elect. Eng. Co.	3,129
B.T.-H. Co.	2,861	Tilley Bros.	3,139
Phœnix Dynamo Mfg. Co.	2,863	Johnson & Phillips, Ltd.	3,151
Crompton & Co.	2,866	Cox-Walkers, Ltd.	3,157
B.T-H. Co.	2,871	Mann, Egerton & Co.	3,167
J. P. Hall & Co.	2,871	Cox-Walkers, Ltd.	3,169
Crompton & Co.	2,873	Electric Construction Co.	3,173
Brush Elec. Eng. Co.	2,876	General Electric Co.	3,176
Phœnix Dynamo Mfg. Co.	2,883	James Howden & Co.	3,180
Crompton & Co.	2,886	W. H. Allen, Son & Co.	3,197
B.T.-H. Co.	2,901	Bruce Peebles & Co.	3,206
J. P. Hall & Co.	2,902	British Westinghouse Co.	3,225
Brush Elec. Eng. Co.	2,906	Electric Construction Co.	3,239
British Westinghouse Co.	2,909	James Howden & Co.	3 250
B.T.-H. Co.	2,911	Tilley Brothers.	3,254
B.T.-H. Co. (recommended)	2,920	British Westinghouse Co.	3,255
Mawdsleys, Ltd.	2,921	Union Electric Co.	3,287
Crompton & Co.	2,922	H. J. Cash & Co.	3,314
do.	2,926	I.-R., G.-P. & T. Wks. Co.	3,330
Lanc. Dynamo & Motor Co.	2,930	Blackburn, Starling & Co.	3,330
B.T.-H. Co.	2,930	Charles Pullan.	3,335
Crompton & Co.	2,931	British Westinghouse Co.	3,345
British Westinghouse Co.	2,939	I.-R., G.-P. & T. Wks. Co.	3,360
Crompton & Co.	2,945	Blackburn, Starling & Co.	3,360
do.	2,946	A. W. Penrose & Co.	3,367
Mawdsleys, Ltd.	2,951	James Howden.	3,367
Crompton & Co.	2,954	British Electric Plant Co.	3,371
do.	2,955	W. H. Allen, Son & Co.	3,378
Union Electric Co.	2,956	Johnson & Phillips	3,381
Crompton & Co.	2,974	Electric Construction Co.	3,396
B.T.-H. Co.	2,990	British Electric Plant Co.	3,401
J. P. Hall & Co.	2,993	Morris-Hawkins, Ltd.	3,412
Union Electric Co.	2,996	James Howden & Co.	3,437
B.T.-H. Co.	3,000	W. J. Fryer & Co.	3,455
Bruce Peebles & Co.	3,008	J. H. Holmes & Co.	3,458
British Westinghouse Co.	3,029	Tredegar & Co.	3,461
J. P. Hall & Co.	3,030	I.-R., G.-P. & T. Wks. Co.	3,470
Mawdsleys, Ltd.	3,035	British Electric Plant Co.	3,488
Cox-Walkers, Ltd.	3,037	Tredegar & Co.	3,491
Mawdsleys, Ltd.	3,040	James Howden & Co.	3,494
Mann, Egerton & Co.	3,043	J. H. Holmes & Co.	3,548
Crompton & Co.	3,043	Dargue, Griffiths & Co.	3,554
Lancs. Dynamo & Motor Co.	3,044	James Howden & Co.	3,564
General Electric Co.	3,046	J. H. Holmes & Co.	3,628
Cox-Walkers, Ltd.	3,049	I.-R. G.-P. & T. Works Co.	3,639
Phœnix Dyn. & Motor Co.	3,060	do. do.	3,675
Crompton & Co.	3,061	Higgins & Griffiths	3,726
do.	3,064	T. Scott Anderson	3,862
do.	3,066	Tilley Bros.	3,960
B.T.-H. Co.	3,068	Newtons, Ltd.	4,218

CONTRACT No. 2.—*Steam, Exhaust and Drain Pipes and Valves.*

Alton & Co. (recommended)	£348	Mann, Egerton & Co.	£400
Babcock & Wilcox, Ltd.	356	Brush Elec. Engineering Co.	409
do.	362	Brightside Foundry Co., Ltd.	430
Cox-Walkers, Ltd.	369	Higgins & Griffiths	435
Blackburn, Starling & Co., Ltd.	379	Tredegar & Co.	436
Crompton & Co.	388	H. J. Cash & Co.	449
Johnson & Phillips	388	Tilley Bros.	451
John Wilson & Co.	393	T. Scott Anderson	476
Dargue, Griffiths & Co.	395	W. J. Fryer & Co.	489
J. H. & S. Spencer, Ltd.	397		

CONTRACT No. 3.—*Main Cables, Distribution Boards, Wiring and Lamps, for Main Buildings and Detached Blocks.*

J. T. Mayfield & Co.	£6,707	Blackburn, Starling & Co.	£8,321
Johnson & Phillips	7,398	W. J. Fryer & Co.	8,440
Tilley Bros.	7,606	Charles Pullan	8,511
W. J. Furse & Co.	7,653	Higgins & Griffiths	8,524
Pinching & Walton	7,807	T. Scott Anderson	8,588
Lund Bros. & Co.	7,816	John Hunter & Co.	8,615
H. J. Cash & Co. (recommended)	7,914	Foote & Milne	8,624
Brush Elec. Eng. Co.	7,918	Tamplin & Makovski	8,894
Cox-Walkers, Ltd.	7,968	Tredegar & Co.	9,490
G. E. Taylor & Co.	8,051	Western Electric Co.	9,521
Dargue, Griffiths & Co.	8,159	Felgate & Storey	10,914
A. V. Giffkins & Co.	8,159	Wells, Rayner & Co.	12,696
Mann, Egerton & Co.	8,258		

CONTRACT No. 4.—*Motors and Switchgear.*

Union Electric Co.	£266	Electromotors, Ltd.	£388
Wells, Rayner & Co.	277	Brush Elec. Eng. Co.	389
Union Electric Co.	281	C. C. Pudney	393
Morley Electrical Eng. Co.	292	Brush Elec. Eng. Co.	397
Mawdsleys, Ltd.	293	Cox-Walkers, Ltd.	398
Phœnix Dynamo Mfg. Co.	293	I.-R., G.-P. & T. Works Co.	399
Mann, Egerton & Co.	296	General Electric Co.	403
Mawdsleys, Ltd. (recommended)	306	Johnson & Phillips	407
Morley Electrical Eng. Co.	307	British Westinghouse Co.	420
Phœnix Dynamo Mfg. Co.	321	Lund Bros. & Co.	426
G. E. Taylor & Co.	327	Veritys, Ltd.	435
J. H. Holmes & Co.	327	Dargue, Griffiths & Co.	436
G. E. Taylor & Co.	342	Electric Ordnance & Accessrs.	437
Tredegar & Co.	342	British Electric Plant Co.	438
General Electric Co.	346	Morris-Hawkins, Ltd.	439
Brush Elec. Eng. Co.	353	Electric Construction Co.	448
Charles Pullan	356	Higgins & Griffiths	455
J. H. Holmes & Co.	357	Blackburn, Starling & Co.	471
General Electric Co.	366	W. J. Furse & Co.	480
Cox-Walkers, Ltd.	368	Pinching & Walton	498
W. J. Fryer & Co.	368	Electric Construction Co.	503
Dargue, Griffiths & Co.	372	Siemens Bros. Dynamo Works	600
H. J. Cash & Co.	380	J. E. Saunders	675
Newtons, Ltd.	380	T. Scott Anderson	735
General Elec Co.	381	Newmans	1,024

CONTRACT No. 5.—*Telephones, Bells, Time Recorders, Fire Alarms and Electrical Clocks, for Main Buildings and Detached Blocks.*

Marples, Leach & Co.	£1,511	Mann, Egerton & Co.	£2,550
C. C. Pudney & Co.	1,828	Brush Elec. Eng. Co.	2,632
J. T. Mayfield & Co.	1,840	Charles Pullan	2,858
H. J. Cash & Co. (recommended)	1,851	Lund Bros. & Co.	2,996
W. J. Furse & Co.	1,864	Blackburn, Starling & Co.	3,005
Bell Telephone Co.	2,089	S. Hammond & Co.	4,239
Private Telephone Co.	2,115	Wells, Rayner & Co., main buildings only	1,590
Higgins & Griffiths	2,311	W. J. Fryer & Co., main buildings only	1,936
Cox-Walkers, Ltd.	2,356		
Johnson & Phillips	2,451		

Tenders recommended are subject to approval of details. It should be pointed out that the figures for contracts Nos. 3 and 5 refer to both main and detached buildings. The contract refers to main buildings, the detached buildings being provided for to be put in hand individually at the Committee's option. The figures for Nos. 1 and 4 include a large number of alternatives.

Glasgow.—The T.C.'s sub-committee has accepted the following offers:—

Steel ladders and gangways, Pinkston power station.—Mechan & Sons, Ltd.
Glass-floor, Rutherglen sub-station.—St. Pancras Iron Works Co., Ltd.

The offer of Bolckow, Vaughan & Co. to supply 2,000 tons of rails, and that of the Barrow Hæmatite Steel Co. to supply 2,000 tons of fishplates, have been accepted, also that of Messrs. R. White & Sons for bridge rails.

Hornsey.—The B.C. has accepted the tender of the British Thomson-Houston Co., Ltd., for the supply of mercury meters for 12 months.

An order for electricity meters for the Council has been given to the Bastian Meter Co, Ltd.

J. & P. Contracts.—The following is a list of some contracts recently secured by Messrs. Johnson & Phillips, Ltd.:—

GRAVESEND.—Electricity Committee (recommended).—Supply and erection of long burning magazine flame arc lamps, posts, &c.

EBBW VALE.—The Ebbw Vale Steel Iron and Coal Co.—Supply and erection of a 6,600-volt three-phase overhead transmission line.

VICTORIA.—Postmaster General.—Supply of a submarine cable gear for the Australian Commonwealth.

MENAOS (Through Messrs. J. G. White & Co.).—Supply of the main switchboard for the Menaos E.L. & P. Co.

LINCOLN.—Waterworks Committee.—Supply and erection of telephone line, instruments, &c.

LYME REGIS.—Lyme Regis E. L. and P. Co.—Supply and erection of an overhead transmission line and underground mains.

ABERTILLERY.—U.D.C.—Supply and erection of an overhead transmission line and underground mains.

LEITH.—Electricity Department.—Forty arc lamps, "Bell" contact gears and accessories.

STOKE-ON-TRENT.—Midland Coal, Coke and Iron Co.—Supply and erection of single and three-cored vulcanised bitumen cables for their Birley pit.

BERWICK.—Urban Electric Supply Co.—Sixteen of their long-burning magazine flame arc lamps.

BRIDGEND.—Bryndu Colliery Co.—Supply and erection of vulcanised bitumen surface and shaft cables, distribution boards, &c., for their Bryndu colliery.

Liverpool.—Messrs. Rushworth & Dreaper, of Liverpool, have obtained the contract for installing electrical power for blowing the organ at Huyton Parish Church.

London.—L.C.C.—For the new tramway operations which will be proceeded with during 1909-10 it is necessary to provide 250 new electric cars. The Highways Committee recommends that 200 should be built on the lines of the Council's standard pattern (vestibule roof-covered, with a full complement of brakes), and that the remaining 50 should be of special construction, particularly designed for safe working over certain tramway routes where the gradients are very steep. The total cost of all will be £237,500. In regard to the 50 special cars, it is proposed to, in the first instance, ascertain the exact type of car which the B. of T. would be prepared to approve. With that object it is proposed that a specimen car should be built before the other 49 be proceeded with. The body will be built at the Council's Leytonstone car works, the car truck, steel underframe, electrical equipment, and other necessary fittings, being obtained under existing contracts or by inviting tenders from selected firms.

The following tenders were received for the 200 bodies, trucks, &c.:—

Car Bodies.

—	Tender A. Per car body fitted with side life-guards as at present, and including £15 per car for extra works.	Tender A. Reduction per car body if no side life-guards.	Tender A. Total.	Tender B. Per car body fitted with life-guards and lifting steps of the Simplex type, including £15 per car for extra works.	B. Total.
Hurst, Nelson (recommended)	£390	£4	£78,000	£387	£77,350
United Electric Car Co., Ltd.	400	2	80,000	400	80,000
Brush Elec. Eng. Co.	412	2 10	82,400	412	82,500
Metro. Amalgamation Railway Carriage and Wagon Co.	412	2	82,400	416	82,700
Gloucester Railway Carriage & Wagon Co., Ltd.	419	2 5	20,950 (50 only)	426	21,300 (50 only)

Car Trucks.

	Price for each pair of trucks, including £5 for extra works.	Total.
Hurst, Nelson & Co., Ltd. .. .. (recommended)	£119 10	£28,900
Mountain & Gibson, Ltd.	132 15	26,550
Heenan & Froude, Ltd.	134 15	26,950
W. R. Renshaw & Co., Ltd.	137 10	27,500
United Electric Car Co., Ltd.	140	28,000
Metropolitan Amalgamated Railway Carriage and Wagon Co., Ltd.	150	30,000
Brush Elec. Eng. Co., Ltd.	155	31,000
Peckham Development Co., Westminster	155	31,000
	*165	*33,000

* Price quoted in schedule of prices is £10 a pair in excess of that quoted in tender.

Electrical Equipment and Assembly of Cars.

	Price per set, including sum for trolley equipment and £24 10s. for extra works and supply of ploughs.	Total.
British Westinghouse Electric and Mfg. Co. (recommended)	£318	£63,650
Dick, Kerr & Co., Ltd.	325	65,000
British Thomson-Houston Co., Ltd.	334	66,750

The British Westinghouse Co. will supply brakes for the 200 cars at £57 per set (total, £11,400), this being the price paid to the company for similar brakes supplied in connection with the contract of 1908 for 175 car equipments. The Committee state that "Hurst, Nelson & Co., Ltd., have also offered to supply the trucks with steel castings of foreign manufacture instead of British made castings as specified in the tender. If this offer were accepted the total cost of the 200 cars would amount to £175,950, as against £176,950. Having regard, however, to the small difference between the two amounts, and to the additional cost which would be involved in the supervision of the manufacture of the castings abroad, we have thought it right to recommend the acceptance of the tender, as submitted, which, as stated above, provides for castings of British make. The cost of each car under the contracts now proposed to be entered into will amount to £884 15s., as compared with £897, the cost of each car under the contracts obtained in 1908."

Parts of the work will be sub-let, the following being the firms named in this connection:—

John Rogerson & Son, Hadfield's Steel Foundry Co., Ltd., S. Osborne and Co., W. Shaw & Co., or the Stockton Steel Foundry Co., Shotten Bros., J. Crowley & Co., or the Leys Malleable Foundry Co., Cammell, Laird and Co., the Bessemer Steel Co., Ltd., or Brown Bayley & Co., West Bromwich Spring Co., Tempered Spring Co., or Geo. Salter & Co., E. Baylte & Son, G. Walker & Son, or Thomas Williams, Ltd., the Anti-Attrition Metal Co., Watlington & Co., or Brecknell, Munro & Rogers.

The following tenders were sent in for the conversion of a 2½-ton single-motor overhead crane at the central car repair depôt into a three-motor type crane:—

Appleby, Ltd. .. .. (recommended)		£374
Royce, Ltd.		415
Higginbottom & Mannock, Ltd.		460

For an electrically driven power hammer, for use at the same depôt, the following tenders were received:—

B. & S. Massey .. .. (recommended)		£273
Peter Pilkington, Ltd. (not to specification)		275
Buck & Hickman, Ltd.		280
C. W. Burton, Griffiths & Co.		288
Standard Engineering Co., Ltd.		288

Estimate of Chief Officer, £300.

The tender of Messrs. J. Holroyd, Ltd., for milling cutters and setting jig for machining magnetic brake-shoes at the depôt, at £108. That of Hadfield's Steel Foundry Co., Ltd., has been accepted for 30 pairs of movable-tongue manganese points, £960. This firm quoted £32 per pair, against £34 quoted by Edgar Allen and Co.

WANDSWORTH.—The following tenders were received by the L.C.C. for the electric lighting and bell work at the new secondary school, Putney:—

S. R. Love & Sons		£655
Pinching & Walton .. .. (recommended)		665
R. Bridger & Co.		694
C. Larkins & Co., Ltd.		720
G. Weston & Sons		720
Tilley Bros.		523
Balchin Schulz & Co., Ltd.		740
R. J. Mecredy, Eaton & Davidson, Ltd.		740
S. Newton & Co.		750
Harper Electric Co.		762
G. Harland, Bowden & Co.		771
G. E. Taylor & Co.		799
D. J. Macdonald		796
Casperds, Limited		824
Whitehead Bros.		848
G. Foster-Curtis & Co.		877

(Chief engineer's estimate, £725.)

The tender of Grant & Blake (£142) for electric lighting work in connection with the enlargement of the Oliver Goldsmith School, Peckham, has been accepted.

KENSINGTON.—The B.C. has accepted a tender of Crompton and Co., Ltd., at £256 for lowering contact gear, for a further 50 arc lamps.

MARYLEBONE.—The B.C. has placed orders with Messrs. Cory and Son and Messrs. Blackmore & Co. for the supply of 7,500 tons of coal for the electricity department, at 10s. 8d., 10s. 9d. and 10s. 10d. per ton.

STOKE NEWINGTON.—The B.C. has placed a contract with the British Thomson-Houston Co., Ltd., for mercury meters for two years.

HAMMERSMITH.—The Electricity Committee, having completed trials of sample carbons submitted, have found that those of Messrs. W. Geipel & Co., the former contractors, are the most satisfactory. The tenders received were as follows:—

Sloan Electric Co.	£213	Veritys, Ltd.	£271
Johnson & Phillips	231	**W. Geipel & Co.** (accepted) ..	286
H. G. Mayer & Co.	232	General Electric Co.	303
Sirius Werke Manuf. Co. ..	234	Siemens Bros. Dynamo Works	354
Crompton & Co., Ltd.	234	Electrical Co.	606
Ship Carbons, Ltd.	241		

Also from Cratgorne & Green for two items only.

For exhaust steam and water pipes for electricity works extensions the tenders were as follows:—

Alton & Co. (recommended) ..	£95	Cadogan Ironworks, Ltd. ..	£105
J. Spencer & Co., Ltd... ..	104	Westwood & Wright	117
J. Simpson & Co.	104		

The tender of Gwynnes, Ltd., for an "Invincible" centrifugal pressure pump with motor, at £415, has been accepted by the Committee.

Nelson.—The T.C. has accepted the tender of Mr. A. E. Abrahams, of Stratford, London, for advertising on the light railway cars for five years.

Partick.—The burgh authorities have placed an order with the Lancashire Dynamo and Motor Co., Ltd., for one 1,000-KW. Belliss L.D.M. set complete with condenser, cooling tower and the necessary pipework.

Rawtenstall.—The contract for the electric lighting and power installation at the Rawtenstall Corporation car-shed has been let to Messrs. J. Higgin & Co., electricians, Nelson.

Southead.—The T.C. has accepted the tender of T. Bolton & Sons for 740 yd. of copper trolley wire.

Swinton and Pendlebury.—The U.D.C. has accepted the tender of Callender's Cable and Construction Co., Ltd., for cables, service boxes, &c., at £122.

FORTHCOMING EVENTS.

Physical Society.—Friday, June 25th. At 5 p.m. At the Imperial College of Science, South Kensington. Papers on "The Measurement of Wave-Length for High-Frequency Electrical Oscillations," by Mr. A. Campbell; "An Electromagnetic Method of Studying the Theory of and Solving Algebraical Equations of any Degree," by Mr. A. Russell; "Exhibition of a New Fery Thermo-Electric Calorimeter," by Mr. C. V. Drysdale; "An Instrument for Measuring the Strength of an Intense Horizontal Magnetic Field," by Mr. F. W. Jordan.

Faraday Society.—Tuesday, June 29th. At 8.15 p.m. At the Library of the I.E.E. Papers on "Researches on the Relative Rates of Migration of Ions in Aqueous Solution," by Mr. R. B. Denison; "Apparatus for the Rapid Electro-analytical Separation of Metals," by Mr. J. S. Sand; and "The Conditions which Determine the Composition of Electro-deposited Alloys," by Mr. S. Field.

Junior Institution of Engineers.—Friday, July 2nd. At 7.30 p.m. Visit to the engineering workshops and laboratories of the East London College.

NOTES.

Inquiries.—Correspondents wish to know the names of makers of: "Chicago Commutator Compound"; "Stain for colouring electric lamps"; "Lampholder with rubber cord grip."

The Miners' Eight-Hours Act.—The Conference of the Miners' Federation to consider the effects of the Eight-Hours' Act was held at Westminster Palace Hotel on June 17th. Some 160 delegates attended, and reports were considered in private from the different districts showing what negotiations had taken place in regard to the matter. The proceedings were continued on the following day. A joint conference between miners and mine owners to discuss points of difference was proposed.

Tramcar-Driver Demonstrators.—Three years ago the L.C.C. fixed the rate of pay for motor-driving demonstrators at not exceeding 50s. per week, but as the duties of demonstrators have increased with the extension of the tramway system, there being always a large number of men in course of training, and as close supervision by them is necessary in order that efficiency may be maintained, the Highways Committee recommends that the maximum rate be increased to £3 per week.

Annual Outings.—The second annual outing of the staff and employés of the Gillingham Corporation Electricity department took place on Wednesday, June 16th, the party proceeding from the power station in a four-horse brake *via* Newington, Key Street and Detling to the Chiltern Hundreds, which was the rendesvous for the day. On arrival, an adjournment was made to Pennington Heath close by for sports. After this a cold collation was served in a marquee in the grounds of the Chiltern Hundreds hostelry.

The employés of the electric traction maintenance department, Neasden Works, Metropolitan Railway, will spend their annual outing at Southsea on July 17th.

Cricket.—A match took place on the North Shore ground, Blackpool, on the 16th inst., between elevens representing the Blackpool Electricity Works and the B.I. and Helsby Cables Co., of Prescot. The scores read: Blackpool 70, Helsby Cables 42.

In Lighter Mood.—There are doubtless many of our readers who are interested in the art of employing the powers of nature to produce effects apparently supernatural, in the witnessing of acts done by, or seemingly done by, enchantment or sorcery, of performances exciting curiosity or wonder—in a word, in the incomprehensible. To these we would say, go to St. George's Hall and spend an evening with Messrs. Devant and Maskelyne. Mr. Devant, who, by the way, was an old friend of the Electro-Harmonic Society in its early days, gives a most extraordinary display of new and original magical problems, including a series of experiments in mental magnetism and translucidation; "Dyno," the imprisoned hand, plays dominoes with any three of the audience and beats them, and there are other remarkable illusions. Then there is Mr. Essman, a marvellous juggler; Mr. Quinn, the Prince of American Sharpers, who demonstrates how innocent gamblers are cheated; Mr. Ernest Hastings, in a refined turn of humour and music; and Mr. Hemsley, in his original imitations of children. This in itself is enough to convulse the young folks, and, for the matter of that, children of larger growth, with laughter. And finally, a most entertaining and mirthful spiritualistic sketch, "Dr. Wilmar's Thought Pictures," brings the entertainment to a close. Altogether, for both young and old, a most delightful evening can be spent at St. George's Hall, and we hope that Messrs. Devant and Maskelyne may long continue to mystify and astonish by an entertainment which is as unique as it is refined and charming.

Institution and Lecture Notes.—Institution of Mining Electrical Engineers.—A meeting of the above Institution will be held in the Lecture Theatre, North of England Institute of Mining and Mechanical Engineers, Newcastle-on-Tyne, on Saturday, June 26th, at 7 p.m., to nominate officers for that branch for representation on the General Committee, and to receive a report of the progress of the Institution to date.

Society of Engineers.—Those who intend competing for the "Status Prize" offered some months ago should remember that Wednesday, June 30th, is the last day for receiving the papers.

Institution of Electrical Engineers.—In conjunction with the West of Scotland Iron and Steel Institute, the members of the Glasgow Section held their annual excursion last week; the party included Mr. W. W. Lackie, President of the Glasgow Section, Prof. Magnus Maclean, representatives of the Admiralty and Board of Trade, and Mr. James E. Sayers, secretary of the Glasgow Section. Leaving Glasgow by special train, the company embarked on the steamer *Duchess of Hamilton* at Gourock. The vessel proceeded down the Firth, past Arran, and after going round Ailsa Craig, returned by Kilbrannan Sound and the Sound of Bute. The weather was delightful, and the trip was thoroughly enjoyed.

Institution of Electrical Engineers (Students).—We have received further particulars of the Students' Tour in Germany, which will commence on July 9th and end on July 17th. We have already given a list of the works, &c., to be visited. The inclusive cost will be £8 15s. Provincial members may obtain tickets to London and back at single fare and a quarter. Applications should be sent to Mr. E. W. Moss, 20, Huddlestone Road, Tufnell Park, London, N., at once.

Fire.—We are informed that on Sunday a fire occurred at the E.L. station at the Alexandra Docks, Newport (Mon.), and the building was gutted. The damage done is estimated at from £4,000 to £5,000.

Shock Fatality.—On Monday last an inquest was held on the body of Michael Cooney, chief electrician at the Admiralty wireless telegraph station, Humberstone. The evidence showed that on June 8th, after the transmitting room was charged, Cooney suddenly entered it, and immediately received a shock, accompanied by severe burns; tetanus set in, and Cooney died on Sunday last. A verdict of "Accidental death" was returned, the staff being exonerated from any blame.

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the Electrical Review *posted as to their movements.*

Central Station Officials.—West Ham Town Council on Tuesday night had before it the appointment of an electrical engineer in the place of Mr. A. H. Seabrook, resigned. There were 36 applicants for the position, and of these the following were selected to appear before the Council:—Messrs. W. J. Bache, electrical engineer, Cheltenham; H. H. Couzens, deputy city electrical engineer at Bristol; Mr. G. L. Jones, resident engineer at West Ham. In the result Mr. Couzens was appointed, at a salary of £500 a year rising to £700. The successful candidate, who is 35 years of age, has held his present position in Bristol since 1901. He was formerly generating station assistant at Bristol and afterwards mains engineer in the same town. Before coming to Bristol he was chief assistant at the Taunton Corporation electricity works.

Mr. A. E. Faver has resigned the position of fourth assistant engineer at the Hammersmith electricity works, and the vacant post has been advertised. The Islington B.C. has appointed Mr. Faver constructional and repairs engineer to the lighting department, at a salary of £3 per week, vice Mr. M. H. Adams resigned.

Mr. Alfred Jarratt, testing assistant, who has been in the service of the Islington Council for three years, has been promoted to fill the vacancy caused by the resignation of Mr. J. J. Hargreaves, mains engineer.

Mr. H. A. Howie, deputy electrical engineer at Wolverhampton, has been appointed deputy manager and chief assistant at the Sheffield electricity works, at a commencing salary of £300 per annum.

Mr. A. S. Giles, former head of the Blackburn electricity department, and now general manager of Cape Town tramways in South Africa, is home on furlough.

At St. George's Church, Leeds, Mr. W. E. Poole, formerly resident engineer of the Hexham Electrical Supply Co., has been married to Miss M. J. Lee, of Hexham. The bridegroom's father (Rev. W. Poole, Vicar of Stalmine, Lancs.) performed the ceremony.

Tramway Officials.—Mr. J. M. Calder has been presented with a silver tea service by the staff of the Reading Corporation tramways department, on the occasion of his marriage.

General.—Messrs. Ship Carbons, Ltd., have issued a circular to the trade stating that Mr. Paul Weiss, their secretary, and Mr. Franz Taussig, manager, have ceased to be in their employ; they have provisionally appointed Mr. A. Pavlovits as secretary and manager of the company, and he is at present their sole recognised representative.

Mr. Louis W. Smith has recently resigned the position of works' director of Messrs. W. Sisson & Co., Gloucester, high-speed engine manufacturers and marine engineers, and has been appointed managing director of Messrs. Clarke's Crank and Forge Co., Ltd., engineers and forgemasters, Lincoln. The latter firm will, under Mr. Smith's guidance, continue to undertake contracts for all classes of cranks and general forgings, both black and finished machined, and anticipates shortly putting down considerable additions to plant.

Mr. I. E. Winslow has removed to 30, Broadway, Westminster, S.W.

Mr. D. H. Slack has joined the firm of Messrs. Bauer & Imrie, chartered patent agents, as partner.

Mr. H. D. Wilkinson's many friends will learn with regret that his sister, Miss Florence Wilkinson, and cousin, Miss Emily Wilkinson, lost their lives in a boating accident on the Lake of Killarney on Wednesday last.

Obituary.—We learn with deep regret that Mr. G. F. Deacon passed away suddenly in his office at Westminster, on Thursday last week, while engaged in discussing the details of a drawing with his chief assistant. At the inquest the medical evidence showed that death was due to heart disease. Mr. Deacon specialised as a water engineer, and was responsible for many important water supply undertakings in the United Kingdom; but, prior to that, in 1865 he accompanied the Atlantic Cable Expedition as assistant to Lord Kelvin on the *Great Eastern*. Mr. Deacon was a prominent member of the Institution of Civil Engineers, and he held the Telford, Watt and George Stephenson medals. He will also be remembered for the interest that he took in the engineering section of the British Association. He acted as president of that section on the occasion of the last Canadian meeting.

The death has occurred at Berlin, from pneumonia, of Mr. Irving Loveridge, manager of the Western Electric Co. He was in his 50th year.

CITY NOTES.

Sylverlyte Lamp Co., Ltd.—Mr. S. F. Rumball presiding at an extraordinary general meeting, held at Winchester House on Monday, said that further capital being needed for extending the company's operations, it was resolved to sell the undertaking outright to a new company, named Sylverlyte (1909), Ltd., with a nominal capital of £200,000 in £1 shares. The existing company commenced operations in April, 1908, but as there was difficulty in securing satisfactory lenses, it was the end of the year before the first pair of lamps was sent out. The profits for the first three months of 1909 were on the average £300 per month. The resolution selling the undertaking was carried.

Calcutta Electric Supply Corporation, Ltd.—The number of units delivered to consumers during the four weeks ended May 28th, 1909, was 693,479, compared with 552,698 units in the corresponding four weeks of 1908.

Western Telegraph Co., Ltd.—The directors announce the third quarterly interim dividend of 3s. per share, free of income-tax, for the year ending 30th inst., being at the rate of 6 per cent. per annum.

National Electric Supply Co., Ltd.—The directors have declared an interim dividend of 3s. per share, less income-tax, on the ordinary shares for the past half-year.

Provincial Tramways Co., Ltd.—An interim dividend of 3s. per share is to be paid on account of the profit in the financial year ending September 30th, 1909.

Eastern Extension, &c., Telegraph Co., Ltd.—The directors have declared an interim dividend for the quarter to March 31st of 2s. 6d. per share.

R. Waygood & Co., Ltd.

Mr. H. C. Walker, presiding at the ninth annual meeting held a few days ago, said that the past year had been one of severe depression, and they necessarily felt the effects, but by watching expenses and continuing their efforts to obtain new work, they had substantially maintained their margin of profit, enabling them to recommend the same dividend as last year. They had again carried out a number of lift contracts for modern passenger-carrying vessels, some of them being repeat orders from the principal shipping companies, as well as for Government Departments and many eminent private persons. They had sent a patent automatic electric lift to the President of the Brazils, were supplying a passenger lift for the Turkish Houses of Parliament in Constantinople, and had also supplied, at short notice, an electric lift for His Majesty's use in the Leeds Town Hall, while one was to be fitted to the Council House at Birmingham under similar conditions. Competition was steadily increasing in severity, and they had to introduce new machinery from time to time and to carry on experimental work, to reduce cost of production and keep in the forefront of the trade. They had acquired valuable patents applicable to both electric and hydraulic cranes. The profit on trading was £60,775, plus £3,934 dividends on investments. Management expenses were £38,250, and depreciation, £2,873, leaving a balance of £23,586, as against £23,448 last year. The two dividends on the ordinary shares were at the rate of 6 per cent. for the year, and £3,159 was carried forward to next year. The return on investments and loans showed some falling off, owing to the effect of trade depression on all securities and investments. They had no doubt that, with improved trade conditions, there would be a general recovery. It would have been possible to pay a larger dividend out of the available profits, but it was better policy to retain the money in the business, enabling them to buy in the best market and keep a reserve for the future.

The report was adopted.

Marconi's Wireless Telegraph Co., Ltd.

The report for the period ended December 31st, 1908, as printed in the *Financial Times*, states that at the last general meeting sanction was given to the increase of the capital by the creation of 250,000 7 per cent. preference shares of £1 each. The public issue was duly made, and 125,080 preference shares were subscribed for. Although this amount was short of the sum necessary to carry out the entire programme outlined in the prospectus, it was, nevertheless, sufficient to meet the company's current engagements and to provide for the expenditure required to complete the trans-Atlantic stations at Clifden and Glace Bay, and, in addition, allowed the carrying out of a scheme of reorganisation of the works. The works have now been placed on a thoroughly profitable working basis. The close attention of the directors has been given to the completion of the trans-Atlantic stations at Clifden (Ireland) and Glace Bay (Canada), which has occupied a large portion of Mr. Marconi's time, and, although there have been serious delays in the delivery of important sections of the electrical plant, it is now a matter of great satisfaction to the directors to be able to state that the Clifden station is actually complete and fully able to carry out the transmission and reception of trans-Atlantic messages to the extent stated in the prospectus issued on May 29th, 1908. The accounts cover a period of 15 months. The directors thought it advisable to make the company's annual report and accounts synchronise with the calendar year; hence the delay in publishing the report. The directors regret that at present they are not able to declare a dividend. They feel, notwithstanding this, that the prospects and position of the company are now highly satisfactory and promising, and they confidently anticipate that the dividend-paying period will speedily be entered upon. The remunerative business is extending in every direction. Economies have been effected wherever such have been found possible. Expenses have been cut down in all directions, and the field of profitable operation is steadily and persistently extending throughout the world. The fears which they at one time entertained that the ratification of the Berlin Convention by His Majesty's Government would be detrimental to the maritime business of the Associated Marconi Companies have so far not been realised, and, indeed, a considerable addition has been made to the number of ships fitted and working the Marconi system. The directors call attention to the utility of wireless telegraphy in the case of ships in distress, which has never been more strikingly demonstrated than in the accident which resulted in the loss of the White Star liner *Republic* on January 23rd last. Still more recently the wreck of the *Slavonia*, has afforded another opportunity for demonstrating the gratifying extent to which the Marconi system may be utilised in the saving of human life. In December, 1908, Mr. Samuel Geoghegan, of The Grove, Killiney, County Dublin, was elected to a seat on the board, and in January last Mr. Albert L. Ochs resigned his directorship.

Stock Exchange Notices. — The Committee have appointed a special settling day as under:—Wednesday, June 30th, Victoria Falls and Transvaal Power Co., Ltd.—Further issue of 900,000 6 per cent. cumulative preference shares of £1 each, fully and partly paid, Nos. 808,001 to 1,708,000, and have ordered same to be quoted in the Official List. Application has also been made to the Committee to allow the following to be quoted in the Official List: Rio de Janeiro Tramway, Light and Power Co., Ltd.—Further issue of £200,000 5 per cent. 50-year mortgage bonds of £100 each, Nos. B12,001 to 14,000.

J. G. White & Co., Ltd.

In their annual report to February 28th, 1909, the directors say that the results of the business have again been satisfactory, with a net profit on the year's trading of £39,977, an increase on the profits of the preceding period. As usual, profit has only been taken on work actually completed at the date of the balance-sheet. The depression of trade in the last two years has reduced the amount of construction business obtainable, but the company is carrying out important works in Brazil, Argentina and other localities abroad. Negotiations now in progress should lead to additional business within the next few months. The directors feel that, in view of the generally adverse business conditions, the results shown are satisfactory, and they believe that the prospects for the current and future years are encouraging. Investments are shown in the balance-sheet at what, in the directors' opinion, is a conservative valuation. The return of interest and dividends on investments during the year was equal to 5·9 per cent. on the amount of the valuation. The balance to the credit of profit and loss, after bringing in £16,249 from the previous account, deducting the interim dividend paid on the preferred shares at January 1st, 1909, and making provision for percentages due to directors and staff, is £46,960. This sum the directors recommend should be dealt with in the following manner:—

Dividend, free of tax, at the rate of 6 per cent. per annum on the cumulative preferred shares for the half-year to February 28th, 1909 ..	£4,500
Dividend, free of tax, at the rate of 6 per cent. per annum on the ordinary shares for the year to February 28th, 1909	3,000
An additional 2 per cent. on the preferred and ordinary share capital (making a total of 8 per cent. on all shares for the year)	4,000
To reserve (making a total reserve of £100,000)	20,000
Carried forward to next year	15,460
	£46,960

Indian Electric Supply and Traction Co., Ltd.—

The report for the year ended December 31st, 1908, states that the year's working in Cawnpore has resulted in a loss of £9, and to this has to be added final interest on Construction debentures, £7,500; London expenditure, £2,127; and interest on loans, £912; making a total deficiency for the year of £10,549. With the balance of £6,681 brought forward, the total amount at debit of profit and loss account is £17,231. During the first three months of the year (says the *Financial Times* abstract) there was a surplus in Cawnpore, from the supply side of the undertaking, of Rs. 3,060, comparing with a deficiency in the corresponding period last year of Rs. 1,105. The tramway working shows a deficiency of Rs. 5,864, against a deficiency last year of Rs. 8,772. The position, therefore, on both sides of the undertaking has improved. On January 1st the company exercised the option to repay the construction debenture stock by the allotment at par of ordinary shares. The interest charge consequently ceased from that date. Mr. Scott Moncrieff, who was for some years chief engineer of the Calcutta Electric Supply Corporation, and also has a personal knowledge of Cawnpore, has consented to join the board. In order to pay off the creditors and to provide further working capital, it will be necessary to raise fresh capital, and a scheme is being prepared, which will be submitted in due course. A reorganisation of the company's capital will at the same time be necessary, if the business is to be carried to a successful issue.

Mexborough and Rawmarsh Construction Syndicate, Ltd.—The directors' report states (according to the *Financier*) that the net revenue account of the Mexborough and Swinton Tramways Co. shows a profit for the year of £1,142, to which is added £1,495 balance brought forward, making a total of £2,638. After making reserves for depreciation and writing off preliminary expenses and amounts off stock, furniture, fittings and plant and tools, amounting in all to £2,107, there remains a balance of £531, which is being carried forward. The traffic receipts from January 1st to the 15th inst. show an increase of £1,446 over the receipts for the corresponding period of last year, and the net earnings for the same period substantially exceed those for the whole of 1908. This result is brought about by the better service now given and by the substantial reduction in the working costs. The lighting undertakings are also making satisfactory progress, a profit of £430 being earned, as compared with a loss of £328 for the previous year.

Prospectus. — *Para Electric Railways and Lighting Co., Ltd.*—On behalf of this company there has just been offered in London (the list closing yesterday) by the Works Construction Co., Ltd., £700,000 5 per cent. first debenture stock at £92½ per cent., 14,000 6 per cent. cumulative preference shares of £5 each, at £4 12s. 6d. per share, and 70,000 ordinary shares of £5 each at £4 per share. There are 34½ miles of track. The system of the company was described in the Electrical Review a month or two ago, and the annual meeting was recently held in London. It is stated in the prospectus that for the *six months*, beginning December 1st, 1908, the gross receipts were:—Tramways, £75,949; lighting, £34,707, = £110,656; and the expenses, £63,718; leaving a profit of £46,938. Reckoning on that basis, the prospectus estimates that after paying debenture interest and sinking fund and preference dividend, there remains for reserve and ordinary dividend, £37,676 *per annum*.

Melbourne Tramway and Omnibus Co., Ltd.—A dividend of 4½d. per share for the quarter ending June 30th, equal to 15 per cent. per annum, is payable on July 1st.

Great Northern Telegraph Co.—The directors have declared an interim dividend of 5s. per share, less income-tax, for the past half-year.

MARKET QUOTATIONS.

Wednesday, June 23rd.

CHEMICALS, &c.		Latest Price.	Fortnight's Inc. or Dec.
a Acid, Hydrochloric	per cwt.	5/-	..
a „ Nitric	„	22/-	..
a „ Oxalic	„	28/-	..
a „ Sulphuric	„	5/6	..
a Ammoniac, Sal	„	42/-	..
a Ammonia, Muriate (crystal) ..	per ton	£33 10	..
a „ „	„	£30	..
a Bleaching powder	„	£5 10	..
a Bisulphide of Carbon	„	£18	..
a Borax	„	£16	..
a Copper Sulphate	„	£19 10	..
a Lead, Nitrate	„	£25 10	..
a „ White Sugar	„	£23 10	..
a „ Peroxide	„	£22	..
a Methylated Spirit	per gal.	2/6	..
a Potassium, Bichromate, in casks	per lb.	8½d.	..
a Potash, Caustic (75/80 %) ..	per ton	£20	..
a „ Chlorate	per lb.	8½d.	..
a „ Perchlorate	„	8½d.	..
a Potassium, Cyanide	„	7d.	..
a Shellac	per cwt.	70/-	..
a Sulphate of Magnesia	per ton	£4 10	..
a Sulphur, Sublimed Flowers ..	„	£6 10	..
a „ Recovered	„	£5 10	..
a „ Lump	„	£5	..
a Soda, Caustic (white 70 %) ..	„	£10 15	..
a „ Chlorate	per lb.	3½d.	..
a „ Crystals	per ton	£3 5	..
a Sodium Bichromate, casks ..	per lb.	3d.	..
a „ Cyanide (basis 100 %) ..	„	7d.	..
METALS, &c.			
b Aluminium Ingots, in ton lots ..	per ton	£70	..
b „ Wire, in ton lots ..	„	£112	..
b „ Sheet, in ton lots ..	„	£120	..
a Babbit's metal ingots	„	£50 to £135	..
c Brass (rolled metal 2" to 12" basis)	per lb.	7⅜d.	⅛d. inc.
c „ Tube (brazed)	„	8d.	⅛d. dec.
c „ „ (solid drawn) ..	„	7d.	⅛d. dec.
c „ Wire, basis	„	6⅜d.	⅛d. dec.
c Copper Tubes (brazed)	„	8⅜d.	1d. dec.
c „ „ (solid drawn ..	„	8⅜d.	1d. dec.
g „ Bars (best selected) ..	per ton	£74	£2 dec.
g „ Sheet	„	£73	£2 dec.
g „ Rod	„	£73	£2 dec.
e „ (Electrolytic) Bars ..	„	£60 15	£2 10 dec.
e „ „ Sheets ..	„	£77 5	£2 10 dec.
e „ „ Rod ..	„	£75 5	£2 10 dec.
e „ „ H.C. Wire	per lb.	8d.	⅛d. dec.
f Ebonite Rod	„	3/3	..
f „ Sheet	„	3/-	..
a German Silver Wire	„	1/6	..
h Gutta-percha, fine	„	5/6 to 6/6	..
h India-rubber, Para fine	„	6/3	3½d. inc.
i Iron Pig (Cleveland warrants) ..	per ton	48/3	9d. dec.
l „ Wire, galv. No. 8, P.O. qual.	„	£14	..
g Lead, English Ingot	„	£13 7 6 to £13 10	2/6 dec.
m Manganin Wire No. 28	per lb.	8/-	..
g Mercury	per bot.	£8 5	2/6 dec.
d Mica (in original cases) small ..	per lb.	6d. to 1s.	..
d „ „ „ medium	„	2/6 to 4/-	..
d „ „ „ large ..	„	4/6 to 8/6	..
p Phosphor Bronze, plain castings	„	1/- to 1/1	..
p „ „ rolled bars & rods	„	1/1½ to 1/3	..
p „ „ rolled strip & sheet	„	1/2½ to 1/6	..
o Platinum	per oz.	91/6	variable.
e Silicium Bronze Wire	per lb.	9½d.	..
r Steel Magnet, in bars	per ton	£55	..
g Tin, Block (English)	„	£131 to £132	£1 dec.
n „ Wire, Nos. 1 to 16	per lb.	1/8½	..
p White Anti-friction Metals:—			
"White Ant" brand	per ton	£35 to £60	..
k Zinc, Sh't (Vielle Montagne bnd.)	„	£25 10	..

Quotations supplied by—

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d F. Wiggins & Sons.
e Frederick Smith & Co.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakspeare.
h Edward Till & Co.
i Bolling & Lowe.
k Morris Ashby, Ltd.
l Richard Johnson & Nephew, Ltd.
m W. T. Glover & Co., Ltd.
n P. Ormiston & Sons.
o Johnson, Matthey & Co., Ltd.
p The Phosphor Bronze Co., Ltd.
r W. F. Dennis & Co.

South Metropolitan Electric Tramways and Lighting Co., Ltd.—The report for the year ended December, 1908, states that £5,104 has been expended during the year on capital account, making the total £490,407. The total revenue on profit and loss account for the year was £52,240. After deducting all expenses chargeable to revenue, including repairs and maintenance, interest upon the debenture stock, and providing for payments to local authorities under agreements, which together amount to £44,462, there remains a surplus of £7,777, making, with £430 brought forward, £8,207. The dividend on the 6 per cent. preference shares for the half-year ended June 30th, 1908, paid on August 1st last, absorbed £4,903, and the directors recommend that £3,000 be placed to depreciation and reserve fund, leaving £303 to be carried forward. The directors regret that the profits for the past year do not admit of the payment of the full dividend on the preference shares.

Belgium.—The balance-sheet of the Société d'Electricité du Bassin de Charleroi for the last financial year shows a profit of £6,866. A dividend of 25 fr. per share is being declared, as compared with only 22 fr. for the preceding 12 months.

STOCKS AND SHARES.

Tuesday Afternoon.

With a very fair amount of business doing in the Stock Exchange, it must be acknowledged that the activity is "spotty," unevenly spread, spasmodic. Mining markets manage to monopolise most of it: investment departments are dullish, taking them all through. Violent fluctuations in the prices of the Canadian-Mexican issues constitute the outstanding feature amongst electrical sections.

The Home Railway group is tolerably steady, and the attitude of the market may be called expectant. Were any accession of public business to be turned in their direction, Home Rails would certainly respond briskly, but outside interest takes no count of Home Rails, so prices stagnate, with occasional flashes of activity to emphasise the darkness of the ordinary state of affairs.

Metropolitan Consolidated has eased off a little, but Districts improved upon their substantial advance, the weekly traffics being decidedly good. City and South London is down ½, Central London Ordinary and Deferred each fell 1; the failure of the Shepherd's Bush Exhibition to attract the crowds of last year, is one of the reasons for the weakness of Central Londons. East London Ordinary dwindled to 4, and no change has taken place in the company's trio of Debenture stocks. On the other hand, Great Northern and City Preferred "A" shares soared to 17s. 6d.

London United Tramways Preference are flat at 2⅛, and the Debenture stock shows a point fall. Otherwise the Tramways market is unusually inanimate except as regards the stocks and shares connected with the Mexican division.

Mexico Tramways fell 10 points and Rio Trams 8. Mexican Light and Power Common lost 2, and the Preference 3. Small rallies occurred later. Sao Paulo Trams at 151½ are 4 down, and other movements are on a smaller scale.

The reasons given in the Stock Exchange for this slump are various, but at the back of them all lies the patent fact that the buying account that had been built up was far from strong, and therefore, when the bulls were quietly advised to take up their shares, a stampede to sell ensued. The market has been predisposed to weakness for some little time past, and it is said that Continental holders have flung shares on the market at a moment peculiarly inopportune, after the very partial success of the Rio Tramways new Issue, and the bursting of the dam on the Mexican Co.'s property. Shrewd operators profess that they are by no means astonished at this crack in prices, and assert, furthermore, that there will be a sharp recovery when the weaker holders are well shaken out. But manifestly these are not the securities for "everybody's money."

The Para Electric Railways and Lighting Company has been offering for sale £700,000 5 per cent. Debenture stock at 92½, 14,000 6 per cent. cumulative Preference shares of £5 at 4⅝, and 70,000 Ordinary shares of £5 at 4. Figures are provided—as reported by the company's managers and officers—for the first six months of the present financial year, which began on December 1st last. On the statistics quoted, the interest on the Debenture stock seems to be well covered.

Amongst Telegraph issues, the chief feature of interest lies in the way that prior-charge stocks have advanced, the movement taking similar securities of the telephone companies in its train. Rises of ½ or 1 are noticeable in about half a score of stocks, while the Ordinary issues have varied little or not at all. American Telephone and Telegraph reacted 1½, and Anglo-Americans are erratic, the Deferred showing a small recovery, though the Ordinary and Preferred are lower. Eastern Extension shares gained ½ of their recent relapse on the Imperial Press Conference proceedings. Great Northern Telegraphs are unaffected by the declaration of an interim dividend of 5s. a share. Globe Telegraph and Trust Preference hardened in sympathy with the better tone in other Telegraphs.

Marconi's slipped back to 12s. 6d., a fall of 3s. 9d., and National Telephones are not particularly good.

With very few exceptions, the catalogue of prices in the electricity supply list is unchanged save for the Mexican movements already noted, and a point fall in Electrical Development of Ontario bonds. Newcastle-on-Tyne shares are better.

Business in electricity supply shares has nearly reached a full stop, and there is not much doing amongst the manufacturing shares. Electric Construction Preference continue to harden and Telegraph Constructions are 10s. better, while there are slight declines in Babcock Ordinary and Willans & Robinson Preference.

American Telephone and Telegraph Co.—The regular dividend of $2 per share has been declared, payable July 15th.

SHARE LIST OF ELECTRICAL COMPANIES.

TELEGRAPH AND TELEPHONE COMPANIES.

Present Issue.	NAME.	Stock or Share. *	Dividends for the last four years. 1905.	1906.	1907.	1908.	Closing Quotations June 15th.	Closing Quotations June 22nd.	Business done week ended June 22nd, 1909. Highest	Lowest.	Rise + or Fall −	Present Yield per cent. £ s. d.
25,000	Amazon Telegraph Co.'s shares, Nos. 1 to 25,000	10	Nil	Nil	Nil	Nil	2⅜ – 3⅛	2⅜ – 3⅛	..	..	..	Nil.
126,700	Do. do. 5 % Debs., Nos. 1 to 1,250 Red.	100	5 %	5 %	5 %	5 %	94 – 96	94 – 96	96	..	..	5 4 0
$121,551,400	American Telephone & Telegraph, Cap. Stock ..	$100	7½ %	8 %	8 %	8 %	145½–146½	144 –145	145½	..	−1½	5 10 4
$58,000,000	Do. Collat. Trust, 4% Bonds, 1 to 28,000 and 58,001 to 78,000	$1000	4 %	4 %	4 %	4 %	98½–100½	98⅛–100½	..	..	..	3 19 7
598,180	Anglo-American Telegraph	Stock	3⅛%	3⅜%	3⅛%	£3 4s.	57 – 59	56 – 58	..	..	−1	5 10 1
2,200,910	Do. do. do. 6 % Pref.	Stock	6 %	6 %	6 %	6 %	99½–100⅜	99 –100	99½	99	..	5 19 8
2,200,910	Do. do. Deferred	Stock	½%	1⅜%	1 %	8/-	15½– 15⅞	15⅝– 15⅞	15⅝	14½	+ ⅛	2 5 0
50,000	Anglo-Portuguese Tel., 5 % Mort. Deb. Stock Red.	100	5 %	5 %	5 %	5 %	100 –102	100½–102½	..	..	+ ⅛	4 8 11
44,000	Chili Telephone, Nos. 1 to 44,000	5	8 %	8 %	8 %	..	8 – 8⅜	8 – 8⅜	8½	..	..	4 15 6
2,481,350	Commercial Cable, Sting. 500 year 4% Deb. Stk. Red.	Stock	4 %	4 %	4 %	4 %	90½– 92½	90½ – 92½	90½	..	..	4 6 6
16,000	Cuba Telegraph	10	5 %	5 %	6 %	6 %	8⅛– 8⅜	8⅛ – 8⅜	..	..	..	6 15 6
6,000	Do. 10 % Pref.	10	10 %	10 %	10 %	10 %	17 – 18	17 – 18	..	..	..	5 11 1
12,981	Direct Spanish Telegraph, Ord.	5	4 %	4 %	4 %	4 %	2⅞ – 3⅛	2⅞ – 3⅛	..	..	..	5 3 8
6,000	Do. do. 10 % Cum. Pref. ..	10	10 %	10 %	10 %	10 %	8½ – 9	8⅜ – 9	..	..	..	5 11 1
80,000	Do. do. 4½ % Debs.	50	4½%	4½%	4½%	4½%	100 –102	100½–102½	..	..	+ ⅛	8 5 4
60,710‡	Direct United States Cable	20	4½%	4½%	4½%	4½%	12⅜– 12⅝	12⅜– 12⅝	12⅛	12⅜	..	6 10 0
43,500‡	Direct W. India Cable, 4½ % Reg. Deb., 1 to 1,200, R.	100	4½%	4½%	4½%	4½%	100 –102	101 –103	..	..	..	4 8 3
4,000,000	Eastern Telegraph, Ord. Stock..	Stock	7 %	7 %	7 %	7 %	132 –135	133 –135	133	132	..	5 5 3
2,000,000	Do. 5½ % Pref. Stock..	100	5½%	5½%	5½%	5½%	85 – 86½	85½– 87	86½	85½	..	4 0 11
1,896,706	Do. 4 % Mort. Deb. Stock. Red. ..	Stock	4 %	4 %	4 %	4 %	103 –105	103 – 105	103½	..	..	3 16 2
800,000	Eastern Extension, Australasia, and China Tele	10	7 %	7 %	7 %	7 %	11⅞– 12⅛	11⅞ – 12⅜	12⅛	11⅞	+ ⅛	5 18 3
752,400	Do. 4 % Deb. Stock	Stock	4 %	4 %	4 %	4 %	101½–103½	102 –104	..	..	+ ⅛	3 16 11
200,000‡	East. & S. Afric. Tel., 4 % Mt. Db. (Mauritius Sub.) 1 to 8,000	25	4 %	4 %	4 %	4 %	100 –102	100 –102	..	..	..	3 18 5
181,127	Globe Telegraph and Trust	10	5½%	5½%	5½%	5½%	10⅜– 11⅛	10⅜ – 11⅛	11⅛	10⅜	..	5 2 3
181,127	Do. do. 6 % Pref..	10	6 %	6 %	6 %	6 %	12⅜ – 13⅛	13 – 13⅛	13⅛	13⅛	+ ⅛	4 8 11
150,000	Great Northern Telegraph, of Copenhagen.. ..	10	24%	20 %	20 %	18 %	27 – 28	27 – 28	27⅛	27	..	6 8 7
10,000‡	Halifax and Bermudas Cable, 4½ % 1st Mort. Debs., within Nos. 1 to 1,000, Red.	100	4½%	4½%	4½%	4½%	101 –103	101 –103	..	..	..	4 7 5
17,000	Indo-European Telegraph	25	13 %	13 %	13 %	13 %	51½– 53½	51½ – 53½	52	51½	..	6 1 6
$41,280,400	Mackay Companies Common	$100	2 %	3½%	4 %	4 %	78 – 82	80 – 84	..	..	+2	4 15 3
$50,000,000	Do. do. 4% Cum. Pref.	$100	4 %	4 %	4 %	4 %	73 – 76	74 – 77	..	..	..	5 5 3
894,190	Marconi's Wireless Telegraph	1	Nil	Nil	Nil	..	⅜ – ⅞	⅜ – ⅞	16/-	12/6	– 1/6	Nil
72,680	Monte Video Telephone Co., Ltd. Ord.	1	5 %	6 %	6 %	6 %	1 – 1⅛	1 – 1⅛	..	..	..	6 0 0
86,492	Do. do. do. 5 % Pref. ..	1	5 %	5 %	5 %	5 %	1⅛ – 1⅜	1⅛ – 1⅜	16/6	..	..	5 12 11
2,225,000	National Telephone, Pref. Stock	100	6 %	6 %	6 %	6 %	107 –108½	107 –108½	107⅞	107½	..	5 10 7
2,725,000	Do. do. Def. Stock	100	5 %	5 %	6 %	6 %	120½–122½	119½–121½	120⅞	120	–1	4 18 9
15,000	Do. do. 6 % Cum. 1st. Pref.	10	6 %	6 %	6 %	6 %	10½– 11	10½– 11	..	..	..	5 9 1
15,000	Do. do. 6 % Cum. 2nd Pref.	10	6 %	6 %	6 %	6 %	10 – 10½	10 – 10½	..	..	..	5 11 7
250,000	Do. do. 5 % Non-cum. 3rd P., 1 to 250,000	5	5 %	5 %	5 %	5 %	5⅛ – 5⅜	5⅞ – 5⅛	5⅜	..	– ⅛	4 7 2
3,000,000	Do. do. 5% % Deb. Stock Red. ..	Stock	5½%	5½%	5½%	5½%	98 –100	98 –100	99½	..	..	3 10 0
1,716,598	Do. do. 4 % Deb. Stock Red.	100	4 %	4 %	4 %	4 %	100 –102	100½–102½	102	..	+ ⅛	3 18 1
179,313	Oriental Telep. and Elec. 1 to 171,504, fully paid ..	1	7 %	7 %	8 %	8 %	1⅝ – 1⅞	1⅝ – 1⅞	27/9	27/-	..	5 6 8
50,000	Do. do. 6 % Cum. Pref.... ..	1	6 %	6 %	6 %	6 %	1⅜ – 1⅝	1⅜ – 1⅝	..	..	..	5 1 1
99,100	Do. do. do. 4 % Red. Deb. Stock ..	100	4 %	4 %	4 %	4 %	88 – 90	88 – 90	88½	..	..	4 8 11
99,400	Pacific & European Tel., 4 % Guar. Debs., 1 to 1,000	10	4 %	4 %	4 %	4 %	100 –102	100½–102½	..	..	+ ⅛	3 18 1
11,889‡	Reuter's	8	6 %	5 %	5 %	5 %	7⅜ – 8⅛	7⅜ – 8⅛	..	..	..	4 19 9
99,100	Telephone Co. of Egypt, 4½ % Deb. Red.	100	4½%	4½%	4½%	4½%	100 –102	100½–102½	..	..	+ ⅛	4 7 10
3,088	Submarine Cables Trust	Cert.	6 %	6 %	6 %	6 %	128 –131	128 –131	..	..	..	4 11 7
120,000	United River Plate Telephone	5	8 %	8 %	8 %	..	6⅛ – 7 1/16	6⅛ – 7 1/16	7	6⅞	– 1/16	5 13 8
40,000	Do. 5 % Cum. Pref., Nos. 1 to 40,000 ..	5	5 %	5 %	5 %	5 %	5 – 5⅛	5 – 5⅛	..	..	..	4 13 0
80,008	W. Coast of America, 1 to 80,000 & 58,001 to 68,008	2½	Nil	2½%	2½%	..	1⅛ – 1⅜	1⅛ – 1⅜	..	..	..	4 10 11
150,000	Do. 4 % Debs., 1 to 1,500 guar. by Braz. Sub. Tel.	100	4 %	4 %	4 %	4 %	100 –102	100½–102½	..	..	+ ⅛	3 18 1
207,930	Western Telegraph, Ltd., Nos. 1 to 207,930.. ..	10	7 %	7 %	7 %	..	13½ – 14	13½ – 14	13⅛	13⅜	..	5 0 0
800,000	Do. do. 4 % Deb. Stock Red. ..	100	4 %	4 %	4 %	4 %	101 –103	102 –104	103	..	+ 1	3 16 11
88,321	West India and Panama Telegraph	10	Nil	Nil	Nil	Nil	⅞ – 1	⅞ – 1	12/6	11/8	..	Nil
34,568	Do. do. 6 % Cum. 1st Pref.	10	5 %	6 %	6 %	6 %	8½ – 8¾	8½ – 8¾	..	..	..	6 17 2
4,669	Do. do. 6 % Cum. 2nd Pref.	10	Nil	Nil	£2 6	15 %	8 – 9	8 – 9	..	..	..	..
80,000‡	Do. do. 5 % Debs., Nos. 1 to 1,800 ..	100	5 %	5 %	5 %	5 %	102 –104	102½–104½	..	..	+ ⅛	4 15 8

ELECTRICAL RAILWAY, MANUFACTURING AND INDUSTRIAL COMPANIES.

880,000	Anglo-Argentine Trams, 10 % Nom. Cum. 2nd Pref., 260,008 to 580,097	5	8 %	8 %	9 %	10 %	9⅛ – 9⅜	9⅛ – 9⅜	9⅜	9⅛	..	5 2 7
260,007	Do. 6 % Cum. Prefs., 1 to 260,007 ..	5	5½%	5½%	5⅝%	6 %	6⅛ – 6⅜	6⅛ – 6⅜	6⅛	..	..	4 14 1
978,280	Do. 4 % Deb. Stock	..	..	..	..	..	94 – 96	94 – 96	94½	..	..	4 6 6
286,100	Auckland E. Trams, 5 % 1st Mort. Deb. Stock ..	100	5 %	5 %	5 %	5 %	102½–104½	102½–104½	104½	104	..	4 15 8
880,000	Babcock & Wilcox, 1 to 880,000..	1	20 %	20 %	20 %	20 %	4⅛ – 4⅜	4⅛ – 4⅜	89/4½	87/6	..	4 7 4
100,000	Do. do. 6 % Cum. Pref., 1 to 100,000 ..	1	6 %	6 %	6 %	6 %	1⅜ – 1½	1⅜ – 1½	..	..	..	4 0 0
60,000	British Aluminium, Ord., 1 to 40,000	5	7 %	7 %	7 %	7 %	1⅛ – 1⅜	1⅛ – 1⅜	26/8	..	..	20 0 0
60,000	Do. do. 7 % Cum. Pref.	5	7 %	7 %	7 %	7 %	2⅜ – 2⅝	2⅜ – 2⅝	..	..	..	14 14 8
40,100	Do. do. "A" 6 % Cum. Pref.	5	6 %	6 %	6 %	6 %	3½ – 4	3½ – 4	..	..	..	7 10 0
12,897	Do. do. 4 % Funding Certs.	5	4 %	4 %	4 %	4 %	3⅞ – 4⅛	3⅞ – 4⅛	..	..	..	4 8 11
124,400	Do. do. 5½ % Loch Leven Debs. ..	100	..	5½%	5½%	5½%	95 –100	95 –100	..	..	..	5 10 6
500,000	British Columbia E. Rail Def. Ord. Stock	100	6 %	6 %	8 %	8 %	143 –147	143 –147	..	..	..	5 8 10
400,000	Do. Pref. Ord. Stock	100	5 %	5 %	5 %	6 %	122 –125	122 –126	124½	122½	..	4 16 0
300,000	Do. 5 % Cum. Perp. Pref. Stock	100	5 %	5 %	5 %	5 %	109 –112	109 –112	110	..	..	4 9 3
288,000	Do. 4½ % 1st Mort. Debs., 1 to 6,250	40	4½%	4½%	4½%	4½%	102 –104	102 –104	..	..	..	4 6 7
230,000	Do. 4½ % Vancouver Power Debs., 1 to 2,300	100	4½%	4½%	4½%	4½%	102 –105	102 –105	..	..	..	4 5 9
128,801	British Electric Traction	10	3 %	Nil	Nil	..	⅛ – 1/16	⅛ – 1/16	18/-	17/6	..	Nil
161,497	Do. do. 6 % Cum. Pref.	10	6 %	6 %	3 %	..	2⅝ – 3⅛	2⅝ – 3⅛	58/9	57/6	..	8 17 9
1,473,858	Do. do. 5 % Perp. Deb. Stock ..	Stock	5 %	5 %	5 %	5 %	92 – 95	92 – 95	93	92	..	5 5 3
528,986	Do. do. 4½ % 2nd Deb. Stock Red.	100	4½%	4½%	4½%	4½%	68 – 72	68 – 72	..	..	..	6 5 0
100,000	British Insulated and Helsby Cables	5	8 %	10 %	10 %	10 %	7⅜ – 7⅝	7⅜ – 7⅝	7⅜	..	..	6 9 0
100,000	Do. do. 6 % Cum. Pref.	5	6 %	6 %	6 %	6 %	6⅛ – 6⅜	6⅛ – 6⅜	..	..	– ⅛	4 7 3
600,000	Do. do. 4½ % 1st Mort. Deb. Red.. ..	100	4½%	4½%	4½%	4½%	105 –108	105 –108	..	..	..	4 3 4
304,940‡	British Thomson-Houston 4½ % 1st Mort. Debs. ..	100	4½%	4½%	4½%	4½%	91 – 96	91 – 96	..	..	..	4 18 11
400,000	British Westinghouse 6 % Pref., 1 to 300,000 and 375,001 to 475,000	5	Nil	Nil	Nil	Nil	7/16 – 9/16	7/16 – 9/16	5/6	..	..	Nil
1,016,353	Do. do. 4 % Mort. Deb. Stock ..	100	4 %	4 %	4 %	4 %	40 – 44	40 – 44	40½	..	..	9 1 8
50,000	Browett, Lindley & Co., Ord.	1	Nil	Nil	Nil	..	⅛ – ¼	⅛ – ¼	..	..	..	Nil
50,000	Do. do. 6 % Cum. Pref.	1	Nil	Nil	Nil	..	14/6 to 15/6	14/6 to 15/6	..	..	..	Nil
140,976	Brush Electrical Engineering, Ord., 1 to 105,731 ..	2	2½%	Nil	Nil	Nil	0 – ¼	0 – ¼	..	..	..	Nil
300,000	Do. do. Non-cum. 6 % Pref.	2	6 %	Nil	Nil	Nil	0 – ¼	0 – ¼	..	..	..	Nil
125,000‡	Do. do. 4½ % Perp. Deb. Stock ..	Stock	4½%	4½%	4½%	4½%	43 – 48	43 – 48	..	..	..	9 8 6
125,000‡	Do. do. 4½ % Perp. 2nd Deb. Stock..	Stock	4½%	4½%	4½%	4½%	29 – 33	29 – 33	..	..	..	13 12 8
187,610	Calcutta Trams, 1 to 187,610	5	8 %	8 %	6 %	..	4⅜ – 4⅝	4⅜ – 4⅝	92/6	..	..	6 6 4
45,304	Do. 5 % Cum. Pref., Nos. 1 to 20,220..	5	5 %	5 %	5 %	5 %	4⅜ – 4⅝	4⅜ – 4⅝	99/4½	..	..	4 15 3
250,000	Do. 4½ % 1st Deb. Stock..	100	4½%	4½%	4½%	4½%	100 –102	100 –102	..	..	..	4 7 5
85,000	Callender's Cable Construction shares	5	15 %	15 %	15 %	..	9⅜ – 10⅛	9⅜ – 10⅛	10⅛	9 1/16	+ ⅛	7 4 7
40,000	Do. do. 5 % Cum. Pref.	5	5 %	5 %	5 %	..	5⅛ – 5⅜	5⅛ – 5⅜	..	..	..	4 8 11
800,000	Do. do. 4½ % 1st Mort. Deb. Stock Red.	Stock	4½%	4½%	4½%	4½%	105 –107	105 –107	..	..	..	4 4 1
491,229	Cape E. Trams., 1 to 491,229	1	Nil	Nil	Nil	..	⅛ – ¼	⅛ – ¼	..	..	..	Nil
450,000	Castner-Kellner Alkali, 1 to 450,000	1	6 %	8 %	12 %	..	1⅞ – 1⅞	1⅞ – 2	39/6	38/6	+ 1/16	6 0 0
210,168	Do. do. 4½ % 1st Mort. Deb. Stock	100	4½%	4½%	4½%	..	102 –106	102 –106	..	..	..	4 4 11
1,898,610	Central London Railway, Ord. Stock..	Stock	4 %	4 %	5 %	3½%	65 – 67	64 – 66	66	64	–1	4 18 6
553,195	Do. do. 4 % Pref. Stock	Stock	4 %	4 %	4 %	4 %	85 – 87	86 – 87	..	..	..	4 12 0
553,195	Do. do. Def. do.	Stock	4 %	4 %	2 %	2½%	50 – 52	49 – 51	..	..	–1	4 18 0
1,480,000	City and South London Railway	Stock	13½%	3½%	3½%	1½%	32 – 33	31½ – 33½	32½	31½	– ½	4 12 4
85,000	Crompton & Co., Nos. 1 to 85,000	5	2½%	5 %	5 %	5 %	1 – 1⅛	1 – 1⅛	25/-	..	..	9 7 6
120,000‡	Do. 5 % 1st Mort. Reg. Debs., 1 to 800 of £100, and 901 to 11,000 of £50 Red.	..	5 %	5 %	5 %	5 %	94 – 97	94 – 97	..	..	..	5 3

* Unless otherwise stated, all shares are fully paid † A period of nine months. ‡ From Manchester Share List

Continued on next page.

SHARE LIST OF ELECTRICAL COMPANIES.—(*Continued.*)

ELECTRICAL RAILWAY, MANUFACTURING AND INDUSTRIAL COMPANIES.—(*Continued*)

Present Issue.	NAME.	Stock or Share.	Dividends for the last four years. 1905.	1906.	1907.	1908.	Closing Quotations June 15th.	Closing Quotations June 22nd.	Business done week ended June 22nd, 1909. Highest	Lowest.	Rise + or Fall —	Present Yield per cent. £ s. d.
260,000	Dick, Kerr & Co., 1 to 260,000	1	10 %	10 %	10 %	10 %	1⅝ — 1¾	1⅝ — 1¾	..	..	..	8 0 0
305,000	Do. do. 6 % Cum. Pref., 1 to 305,000	1	6 %	6 %	6 %	6 %	1 31/32 — 1 33/32	1 31/32 — 1 33/32	23/9	..	..	4 16 0
276,880	Do. do. 4½ % Deb. Stock	100	4½%	4½%	4½%	4½%	101 —104	101 —104	..	..	..	4 6 7
60,000	Dublin United Trams. (1896), 6 % Pref., 1 to 60,000	10	6 %	6 %	6 %	6 %	13 — 14	13 — 14	..	..	..	4 5 9
99,261	Edison & Swan Utd., "A" shs., £8 pd., 1 to 99,261	5	4½%	4½%	2½%	..	¼ — ⅜	¼ — ⅜	..	..	..	15 0 0
17,189	Do. "A" shares, 01—017,189	5	4½%	4½%	2½%	..	1¼ — 2⅛	1¼ — 2⅛	..	..	..	5 0 0
317,875	Do. 4 % Deb. Stock Red.	100	4 %	4 %	4 %	4 %	70 — 75	70 — 75	..	..	..	5 6 8
67,720	Do. 5 % 2nd Deb. Stock Prov. Certs. all pd.	100	5 %	5 %	5 %	..	84 — 87	84 — 87	..	..	..	5 12 4
112,100	Electric Construction, 1 to 112,100	2	Nil	Nil	Nil	Nil	⅝ — ¾	⅞ — 1⅛	..	..	— 3/32	Nil
81,890	Do. do. 7 % Cum. Pref., 1 to 81,890	2	7 %	7 %	7 %	7 %	1 3/32 — 1 5/32	1 3/32 — 1 5/32	..	..	+ 3/32	9 0 8
25,000	General Electric Co. (1900), 5 % Cum. Pref.	10	5 %	5 %	5 %	..	7⅞ — 7¾	7⅞ — 7¾	..	..	..	6 9 0
200,000	Do. do 4 % Mort Deb.	Stock	4 %	4 %	4 %	4 %	85 — 88	85 — 88	..	..	..	4 10 11
78,000	Gt. N. & City Rail. Pref. Ord. "A" 4 %, 1 to 78,000	10	4 %	4 %	½	Nil	⅝ — ¾	¾ — 1	..	..	+ ⅛	6 13 4
96,000	Greenwood & Batley, 7 % Cum. Pref.	10	7 %	7 %	7 %	..	10½ — 10¾	10½ — 10¾	..	..	..	6 10 8
80,000	Do. do. 5 % Mort. Debs.	100	5 %	5 %	5 %	5 %	102 —103½	102 —103	..	..	..	4 16 10
40,000	Henley's (W. T.), Telegraph Works, Ord.	5	15%	15%	15%	15 %	11⅞ — 12⅜	11⅞ — 12⅜	12 1/16	..	..	6 1 2
40,000	Do. do. 4½ % Pref.	5	4½%	4½%	4½%	4½%	5 — 5⅜	5 — 5⅜	5¼	..	..	4 3 9
150,000	Do. do. 4½ % Mort. Deb. Stock	Stock	4½%	4½%	4½%	4½%	104 —106	104 —106	..	..	..	4 5 9
50,000	India-Rubber, Gutta-percha & Telegraph Works.	10	10%	10 %	10 %	..	14½ — 15½	14½ — 15½	15½	15 3/16	..	6 11 2
87,500	†Liverpool Overhead Railway, Ord.	10	Nil	Nil	½	Nil	¾ — 1	¾ — 1	..	..	..	Nil
10,000	† Do. do. Pref., fully paid	10	5 %	5 %	5 %	5 %	5 — 6	5 — 6	..	..	..	8 6 8
600,070	London United Trams. (1901), 1 to 50,007	10	3 %	3 %	3 %	Nil	2 — 3	1⅞ — 2⅛	..	..	..	4 8 11
399,980	Do. do. 50,008 to 100,000	10	3 %	3 %	3 %	Nil	3½ — 4	3 — 4	..	..	..	4 8 11
125,000	Do. do. 5 % Cum. Pref., 1 to 125,000	10	5 %	5 %	5 %	3½%	2⅞ — 3⅛	1⅞ — 2⅛	..	..	— ⅛	15 0 0
1,881,000	Do. do. 4 % 1st Mort. Deb. Stock	100	4 %	4 %	4 %	4 %	70 — 74	69 — 73	70	69½	—1	5 9 7
5,782,062	Metropolitan Consolidated	100	2½%	1 ½%	½%	½%	38⅜ — 39½	38⅛ — 39	39 1/16	38⅝	— ½	1 5 9
2,640,914	Do. Surplus Lands	100	2½%	2½%	2½%	2½%	69 — 71	69 — 71	70	69	..	3 17 6
3,385,000	Do. District	100	Nil	Nil	Nil	Nil	17 — 17½	17½ — 17⅝	17½	17½	+ ½	Nil
391,337	Metropolitan Electric Trams., Ord.	1	..	..	..	4½%	⅜ — ½	⅜ — ½	..	..	..	..
314,016	Do. do. Defd.	1	Nil	Nil	Nil	Nil	⅜ — ½	⅜ — ½	1/-	..	..	Nil
500,000	Do. do. 5 % Cum. Pref.	1	5 %	5 %	5 %	5 %	31/32 — 1 1/32	31/32 — 1	15/-	..	..	5 19 5
600,000	Do. do. 4½ % Deb. Stock Red.	100	4½%	4½%	4½%	4½%	99 —101	99 —101	100½	100	..	4 9 1
$6,000,000	Mexico Trams Co., Common Stock	..	..	..	..	..	144 —146	146 —148	141	131	..	..
$9,000,000	Do. 1st Mort. 50-year 5% Gld. Bds.	..	..	..	..	5 %	92 — 94	93 — 95	95½	92⅛	+1	5 5 8
245,500	Potteries Electric Traction	1	4 %	4 %	4 %	Nil	⅛ — ⅜	3/32 — ⅛	..	..	..	8 13 0
245,500	Do. 5 % Cum. Pref.	1	5 %	5 %	5 %	5 %	⅜ — ½	⅜ — ½	..	..	..	6 17 11
245,000	Do. 4½ % Deb. Stock	100	4½%	4½%	4½%	4½%	86 — 89	86 — 89	..	..	..	5 1 2
87,850	Telegraph Construction and Maintenance	12	15 %	15 %	17½%	15 %	32½ — 34	33 — 34½	33½	32½	+ ½	5 19 0
150,000	Do. 4 % Deb. Bds., 1 to 1,500 Red., 1909	100	4 %	4 %	4 %	4 %	101 — 103	101 —103	102	..	..	3 17 8
1,000,000	Underground Electric Railway, 5% Prior Lien	..	..	..	..	..	101½ —102½	101 —102	..	..	..	..
2,800,000	Do. do. 4½% Bonds	..	..	..	..	4½%	89 — 91	89 — 91	89½	..	..	4 18 11
4,900,000	Do. do. 6% Income Bonds	..	..	..	..	..	38 — 40	38 — 40	..	..	..	..
66,666	Willans & Robinson, 1 to 30,000 & 80,001 to 116,666	5	Nil	Nil	10 %	Nil	⅜ — ½	⅜ — ½	..	..	..	..
66,666	Do. 6 % C.P., 30,001 to 80,000 & 125,001 to 141,666	1	Nil	..	6 %	6 %	2⅛ — 3⅛	2⅛ — 3⅛	62/6	60/7½	..	7 15 6
246,404	Do. % 1st Mort. Deb. Stock	..	4 %	4 %	4 %	4 %	76 — 80	76 — 78	..	..	..	5 0 0

ELECTRICITY SUPPLY COMPANIES.

15,000	Bromley (Kent) E.L. & P., 1 to 15,000	..	5½%	5½%	5½%	5½%	4⅛ — 4⅜	4⅛ — 4⅜	..	..	..	5 10 0
70,000	Do. do. 4½ % 1st. deb. stock	100	4½%	4½%	4½%	4½%	93 — 96	93 — 96	..	..	..	4 18 9
20,275	Brompton & Kens. Elec. Lt. Sup., Ord., 1 to 20,000	5	10 %	10%	10 %	10 %	8½ — 9	8½ — 9	..	..	..	5 11 1
9,725	Do. do. 7 % Cum. Pref.	5	7 %	7 %	7 %	7 %	8 — 8½	8 — 8½	..	..	..	4 2 4
386,876	Central Electric Supply 4 % Guar. Deb. Stock	100	4 %	4 %	4 %	4 %	97 —100	97 — 100	..	..	..	3 18 5
80,000	Charing Cross and Strand Electricity Supply	5	5 %	5 %	5 %	5 %	3⅞ — 4⅛	3⅞ — 4⅛	..	..	..	5 14 3
80,000	Do. do. do. 4½ % Cum. Pref.	5	4½%	4½%	4½%	4½%	4⅛ — 4¼	4⅛ — 4¼	..	..	..	4 12 4
80,000	Do. "City Undertaking" 4½ % Cum. Pri.	5	4½%	4½%	4½%	4½%	3⅞ — 4¼	3⅞ — 4¼	..	..	..	5 5 11
445,736	Do. do. 4 % Deb. Stock Red.	100	4 %	4 %	4 %	4 %	96 — 99 xd	96 — 99 xd	..	..	..	3 19 3
49,486	Chelsea Electricity Supply, Ord.	5	6 %	4½%	4½%	4½%	3⅝ — 4⅛	3⅝ — 4⅛	..	..	..	5 9 1
175,000	Do. do. 4½ % Deb. Stock Red.	Stock	4½%	4½%	4½%	4½%	102 —105	102 —105	..	..	..	4 5 9
70,595	City of London Elec. Lighting, Ord. 40,001—110,595	10	6 %	6 %	6 %	6 %	10¼ — 11	10¼ — 11	10⅞	..	..	5 9 1
40,000	Do. 6 % Cum. Pref., 1 to 40,000	10	6 %	6 %	6 %	6 %	11⅝ — 12⅛	11⅝ — 12⅛	12 7/16	12½	..	4 16 0
400,000	Do. 5 % Db. Stk., Scrip. (iss. at 115) all pd.	..	5 %	5 %	5 %	5 %	121 —123	121 —124	..	..	+ ½	4 0 8
800,000	Do. 4½ % 2nd. Db. Stk., Prov. Crts., all pd.	100	4½%	4½%	4½%	4½%	101 —104	101 —104	102½	102½	..	4 6 7
50,000	County of Durham Electrical Power, Ord.	5	4 %	4 %	2 %	..	2⅞ — 3⅛	2⅞ — 3⅛	..	..	..	3 6 6
50,000	Do. do. do. 5 % Pref.	5	5 %	5 %	5 %	5 %	3½ — 3¾	3½ — 3¾	..	..	..	6 13 4
250,000	Do. do. do. 5 % 1st Mtg. Deb.	Stock	..	..	..	5 %	96 — 98	96 — 98	..	..	..	5 2 0
40,000	County of London Electric Lighting, Ord. 1—40,000	10	5 %	5 %	5 %	5 %	8⅛ — 8⅝	8¼ — 8⅝	8⅛	..	..	5 14 3
50,997	Do. do. 6 % Pref., 40,001—60,000	10	6 %	6 %	6 %	6 %	10⅝ — 11⅛	10⅝ — 11⅛	10¾	10⅝	..	5 6 8
400,000	Do. do. 4½ % Deb. Stock	..	4½%	4½%	4½%	4½%	106 —109	106 —109	107½	102½	..	4 3 4
400,000	Do. do. 4½ % 2nd. Deb. Stock	Stock	4½%	4½%	4½%	4½%	100 —103	100 —103	..	..	..	4 7 5
80,000	Edmundson's Electric Corporation, Ord. Shares	5	4 %	Nil	Nil	Nil	⅜ — ⅝	⅜ — ⅝	..	..	..	Nil
80,000	Do. do. 6 % Cum. Pref.	5	6 %	8 %	Nil	Nil	⅝ — ¾	⅝ — ¾	..	..	..	Nil
430,500	Do. do. 4½ % 1st Mort. Deb. Stk.	100	4½%	4½%	4½%	4½%	60 — 63	60 — 63	..	..	..	7 2 10
$3,150,000	Electrical Dev. Co. of Ontario, 5% 1st Mtg. Gold Bnds.	$500	..	..	..	5 %	88 — 90	87 — 89	..	..	—1	5 12 4
10,000	Folkestone, 1 to 10,000	5	5½%	5½%	5½%	5½%	4½ — 5	4½ — 5	..	..	..	5 10 0
10,000	Do. 5 % Cum. Pref., 1 to 10,000	5	5 %	5 %	5 %	5 %	5 — 5⅛	5 — 5⅛	..	..	..	4 10 0
90,000	Do. 4½ % 1st Deb. Stock	100	4½%	4½%	4½%	4½%	98 — 101	98 —101	..	..	..	4 9 1
15,000	Hove, 1 to 15,000	5	9 %	9 %	8½%	8½%	7⅛ — 7⅜	7⅛ — 7⅜	..	..	..	5 11 6
$2,400,000	Kaministiquia Power Co., 5 % Gold Bnds.	..	..	..	..	5 %	100—101	100 —101	100⅜	100⅜	..	4 19 0
21,000	Kensington and Knightsbridge Electric Ord.	5	10 %	10 %	10 %	8 %	6⅞ — 7⅛	6⅞ — 7⅛	..	..	..	5 8 6
90,000	Do. do. do. 4 % Deben. Stk.	Stock	4 %	4 %	4 %	4 %	98 — 101	97 — 100	..	..	..	3 19 3
111,000	London Electric Supply Corporation, Limited, Ord.	3	4 %	4 %	2½%	3 %	1⅞ — 2⅛	1⅞ — 2⅛	..	..	..	4 16 0
70,000	Do. do. do 6 % Pref.	5	6 %	6 %	6 %	6 %	5⅜ — 5⅝	5⅜ — 5⅝	..	..	..	5 11 8
374,295	Do. do. 4 % 1st Mort. Deb. Stk. Red.	Stock	4 %	4½%	4½%	4 %	90 — 94 xd	90 — 94 xd	..	..	..	4 3 4
200,000	Metropolitan Electric Supply, 1 to 100,000	5	10 %	8 %	6½%	5 %	4⅜ — 4⅝	4⅜ — 4⅝	..	..	..	5 5 3
70,121	Do. 4½ % Cum. Pref. 1—71,106	5	4½%	4½%	4½%	4½%	4⅛ — 5⅛	4⅛ — 5⅛	..	..	..	4 5 9
230,000	Do. 4½ % 1st Mort. Deben. Stock	..	4½%	4½%	4½%	4½%	107 —110	107 —110	..	..	..	4 1 10
248,000	Do. 3½ % Mort. Deben. Stock Redem.	Stock	3½%	3½%	3½%	3½%	85 — 88	85 — 88	..	..	..	3 19 7
$6,000,000	Mexican Electric Light Co., 5% 1st Mtg. Gold Bnds	..	5 %	5 %	5 %	5 %	83 — 85	82½ — 84½	84½	84	— ½	5 18 4
12,585,000	Do. Light and Power Co., Ltd., Common	$100	..	..	..	3½%	70 — 73	68 — 71	71½	69	—2	4 14 7
$1,500,000	Do. do. 7% Cum. Pref. Stk.	Stock	..	..	..	7 %	107 —109	104 —107	107	105	—2½	6 7 3
$12,000,000	Do. do. 5% 1st Mtg. Gold Bnds.	..	..	..	..	5 %	87 — 89	85½ — 87½	88⅛	86	—1½	5 13 0
260,000	Midland Electric Corporation, 4½ % 1st Mort. Deb.	100	4½%	4½%	4½%	4½%	95 — 98	95 — 98	..	..	..	4 11 10
87,500	Newcastle-on-Tyne, 1 to 87,500	5	8 %	8 %	8 %	2½%	4⅝ — 5	4⅝ — 5⅛	..	..	+ 1/16	2 7 8
87,500	Do. 5 % Pref., 1 to 87,500	5	5 %	5 %	5 %	5 %	4⅛ — 5⅛	4⅛ — 5⅛	..	..	..	4 16 8
123,500	North Metropolitan Electric Power Supply Co., 5 % Mortgages (Red.), Nos. 1 to 1,265	100	..	..	..	..	99 — 101	99 —101	..	..	..	..
10,859	Notting Hill Electric Lighting	10	7½%	7½%	7½%	7 %	11⅜ — 12½	11⅜ — 12½	..	..	..	5 12 0
20,000	Oxford, 1 to 96 and 407 to 20,310	5	7 %	7 %	7 %	..	6 — 6⅛	6 — 6⅛	..	..	..	5 7 8
50,000	Do. 4 % Deb. Stock	100	4 %	4 %	4 %	4 %	94 — 97	94 — 97	..	..	..	4 1 8
119,694	River Plate Elcty. Co. Ord. Nos. 1 to 120,507	1	..	2½%	6 %	8 %	1⅜ — 1½	1⅜ — 1½	28/-	..	..	5 6 8
100,000	Do. do. 6% Non Cum. Pref. Nos. 1 to 100,000	1	6 %	6 %	6 %	6 %	1⅜ — 1⅝	1⅜ — 1⅝	21/-	..	..	5 4 4
104,684	Do. do. 6% Deb. Stk. Red.	100	6 %	6 %	5 %	5 %	108 —107	108 —107	..	..	..	5 8 1
40,000	St. James' and Pall Mall Electric Light, Ord.	5	12½%	10 %	10 %	10 %	8⅞ — 9⅛	8⅞ — 9⅛	9	8⅞	— ⅛	6 13 4
90,000	Do. do. 7 % Pref. 20,061 to 40,060	5	7 %	7 %	7 %	7 %	7 — 7⅛	7 — 7⅛	7⅛	7⅛	..	4 13 4
150,000	Do. do. 3½ % Deb. Stock Red.	100	3 %	3½%	3½%	3½%	86 — 90	86 — 90	..	..	..	3 17 9
12,000	Smithfield Markets Electric Supply, Ord.	5	4 %	Nil	Nil	Nil	⅛ — ⅜	⅛ — ⅜	..	..	..	Nil
85,000	South London Electric Supply, Ord.	4	4 %	3 %	4 %	5 %	2⅞ — 3⅛	2⅞ — 3⅛	..	..	..	6 9 0
20,000	South Met. Elec. Lt. & Power, Ord.	1	2½%	2½%	2½%	2½%	⅝ — ¾	⅝ — ¾	..	..	..	4 8 11
142,968	Do. do. 7 % Pref.	1	7 %	7 %	7 %	7 %	1⅛ — 1 1/16	1⅛ — 1⅛	..	..	..	5 6 8
220,000	Do. do. 4½ % 1st Deb. Stk.	100	4½%	4½%	4½%	4½%	100 —103	100 —103	..	..	..	4 0 0
80,000	Urban Electric Supply, Ord.	5	5 %	5 %	5 %	5 %	⅞ — 1	⅞ — 1	..	..	..	25 0 0
50,000	Do. do. 5 % Cum. Pref.	5	5 %	5 %	5 %	5 %	1¾ — 2⅛	1¾ — 2⅛	..	..	..	10 10 6
75,000	Do. do. 4½ % 1st Mort. Db. Stk. Red.	100	4½%	4½%	4½%	4½%	80 — 84	80 — 84	83	81⅛	..	5 7 2
808,000	Victoria Falls Power Co., Pref. Nos. 1 to 800,000	1	..	..	..	5 %	3⅜ — 3½	3⅜ — ⅝	17/6	..	..	5 19 5
110,000	Westminster Electric Supply, Ord.	5	12 %	12 %	10 %	10 %	8⅞ — 9⅛	8¼ — 9⅛	8¾	..	..	5 6 8
81,979	Do. do. 4½ % Cum. Pref. Reduced from 5% since 31st Dec., 1905)	5	5 %	4½%	4½%	4½%	5⅛ — 5¼	5⅛ — 5¼	5 1/16	..	..	4 1 10

* Unless otherwise stated, all shares are fully paid. † Quotations on Liverpool Stock Exchange. Interim Dividend.

TEMPERATURE ERRORS IN SHUNTED AMMETERS.

By W. FENNELL, A.M.I.E.E.

SHUNTED ammeters are now used in large numbers on switchboards, and shunted supply meters are also used to a considerable extent for large currents, and in some types for quite small currents. It is probably correct to say that shunted instruments are gradually replacing the unshunted type, both inside and outside the central station, and it is a matter of importance for engineers and manufacturers to realise the errors which may arise in these instruments, and to take the necessary steps to eliminate them as far as possible.

It is obvious that serious errors may arise, due to changes of temperature. On switchboards the meter is usually placed in a case, while the shunt is fixed quite apart from the meter, the great object of a shunted switchboard instrument being to avoid carrying heavy main cables to the meter position. It follows that the temperature of a shunt follows quite a different cycle from that of the meter. The shunt temperature will vary from atmospheric to somewhere near 180° F., according to load, while the meter remains at nearly constant temperature, owing to the heat capacity of the case and the large surface exposed. In the case of a wattmeter the volt circuit determines the meter temperature, and this is practically constant. It is clear that if the shunt resistance has a low temperature coefficient the temperature error will be very low indeed, even if the instrument resistance is made up of copper, which has a high temperature coefficient, because it remains at a nearly constant temperature. The writer is not here referring to the error of the meter itself, due to variations in the atmospheric temperature—this is another matter—but to the error due to the unequal cycles of temperature of the shunt and of the meter when in the same room. There is another, and perhaps a better, way of securing constancy; if the shunt were made of the same material as the instrument circuit, say of copper, and if both were run at a low current density, so that their temperature remained atmospheric, we should then be able to secure a constant ratio even with a low instrument resistance. For instance, on a switchboard a short length of copper strip used for connections could be shunted by a low-resistance meter with perfectly satisfactory results, if the shunt contacts were bolted and soldered. The advantages gained would be a low volt drop, and absence of high current densities. The writer thinks that many of the ammeter and supply meter shunts now used can, by reason of the high current density, be considered as fuses, and a short circuit has in his experience resulted in the fusing of the shunt and destruction of the meter. Surely no ammeter or wattmeter should be capable of being "burnt out," as short circuits are inevitable.

Apart from ordinary temperature errors, there are other errors of a serious nature. The writer has noted a most curious error in a shunted ammeter. The conditions were as under:—

The shunt consisted of thin laminated metal, soldered into copper lugs, which were bolted at either end to copper strip. The ends of the copper strip were tinned, but the lugs were not. The ammeter, which is of the centre zero type, was connected to various shunts through a multiple-contact switch. It was found, on loading up the circuit, that the ammeter would not permanently indicate more than 10 amperes, although it was known that the reading should be over 20 amperes. An investigation was made, with the result that one of the bolted connections was found to be hot and the other cool. The circuit was then made quite dead, and it was noticed that there was a reading of 10 amperes on the other side of zero. This negative reading continued, decreasing as time went on until the main contact cooled. When the multiple-contact switch was moved off the defective shunt circuit the needle returned to zero. It was found, by-the-by, that the bolt at the bad contact was quite tight. As the circuit was indisputably dead, it was rather strange to find these "spirit" readings. The cause was the existence of a thermo-electric junction. One contact was hot, the heat was conducted to the junction between the shunt strip and the lug, but owing to the large surface and to the length of the shunt strip, the heat was not fully conducted to the other terminal, so the following conditions existed:—

Copper—J—resistance strip—J_1—copper. J was hot and J_1 cold, with a resulting thermo-electric potential. This E.M.F. happened to oppose the legitimate drop of volts in the shunt. If the hot junction had been on the opposite lug, the normal reading would have been increased instead of being diminished.

In order to verify the conclusions arrived at, after the contact had been cleaned and remade a blow lamp was applied to one of the lugs. The results were exactly reproduced; indeed, higher false readings were easily obtained. It is almost certain that the cause of the refusal of the instrument to permanently indicate more than 10 amperes (although it would do so for a short time) was that, although the increased current was indicated momentarily, the increased heat generated at the bad contact soon caused a corresponding increase in thermo-electric potential, and thus brought the reading down again.

There is, of course, nothing new in the fact that thermo-electric potentials will cause inaccuracies in instruments—this has been well known for years; but the writer thinks the effect has been forgotten of late years by designers of instruments, judging from the lines on which shunted instruments are now turned out. It must be remembered that the drop of volts in shunts has been greatly reduced of late, and, consequently, a small thermo-E.M.F. has now more effect. Further, due no doubt to the cutting of prices, the working temperatures of shunts have been increased, and the size of terminal surface contact has been decreased. These qualities have the effect of increasing the risk of bad contacts, as high temperatures tend to oxidation of surfaces.

It would appear necessary, therefore, to insist on the following precautions being taken:—Plain bolted contacts should be avoided, or, if inevitable, the contact lugs should be far removed from the shunt strip lugs. A good design would be to make the bolted connection to an extension lug, connected to the shunt strip lug by a fair length of copper strip of large surface, so that local heating due to poor contacts would not reach the shunt strip. If terminals must be near the shunt strip, the contact should be a multiple one, depending upon several screws, tapped into the shunt lug. Where cable is connected to the lug, as in shunted supply meters, the grub screws should be equal in diameter to the cable socket, so that a full contact will be made, even if the cable is considerably smaller than the socket. Two grub screws per hole should be provided, and if possible two holes should be arranged, so that the cable may be split and two separate contacts made.

It may be said that these requirements cost money, but really it is only a matter of a shilling or two at the outside, and inaccuracies in meters cost much more.

The writer has found that a bad contact may mean in a shunted meter 10 to 20 per cent. inaccuracy, or even the reversal of an instrument at certain loads. Assuming such an error to exist on a supply meter due to defective cable connections, it will not be repeated in the test room, and the consumer will be told in all good faith that the instrument is correct. The meter will probably read correctly when re-fixed, because the cable contacts will be new, and the consumer will suspect that it has been tampered with and that he has been deceived. It is, no doubt, interesting to speculate upon the probable number of disputes caused by reason of bad-contact errors, but it is annoying to think that they are rarely brought to a satisfactory conclusion, because the cause is removed when the meter is taken away to be tested.

Electrical Works and Airships.—The Siemens-Schuckert Works Co., of Berlin, has embarked on the construction of airships; the garage for the first is about to be erected at Biesdorf on the Strausberg railway, and will be capable of being turned by electricity. The airship, which is to be of the non-rigid type and over 333 ft. long, has already advanced to the stage of being rigged, and will be provided with three cars.

COMPARISON BETWEEN THE PARSONS AND IMPULSE TYPES OF TURBINE IN STEAM ECONOMY.

By E. J. F.

IT is only quite lately that sufficient information has been available to make a comparison possible between the efficiencies obtainable from turbines of the Parsons type and turbines of the impulse type, although the latter type, coming forward after the Parsons type had been well established, has laid claims to superior economy than was obtainable with turbines of the Parsons type.

In making a comparison between the relative results obtained on one test and the results obtained at another, it is imperative that the comparisons should be made between them on the basis of thermo-dynamic efficiency of the plant, *i.e.*, the efficiency prevailing in each case in the direction of utilising the available heat in the steam. It is altogether too misleading to compare results on the basis of pounds of steam per hour, in view of the steam pressure, superheat and vacuum varying in each case.

A test was made on November 30th and December 1st of last year by the Berlin and Dortmund Boiler Insurance Co. on a 4,000-KW. turbine of the impulse type built by the Allgemeine Elektricitäts Gesellschaft, of Berlin, and running at 1,500 R.P.M., the alternator being arranged for a periodicity of 50 cycles per second. The temperature of the steam varied on the different tests between 330° C. and 350° C., and the vacuum between 97·3 per cent. and 98·2 per cent. Corrections were, however, made to a common temperature of 300° C. and to a vacuum of 95 per cent., and the results obtained under these conditions at full load were represented by 13·2 lb. of steam per KW.-hour. This is equivalent to a thermo-dynamic efficiency of 63·9 per cent.

During June, 1907, some tests were carried out on two 2,000-KW. turbo-alternators of the Willans-Parsons type, built by Messrs. Willans & Robinson, Ltd., of Rugby, for the Municipality of Sydney, the tests being made under the supervision of Messrs. Preece & Cardew, consulting engineers to the Sydney Municipality.

The results of these trials were published at the time, and under the conditions given gave a result of 15·5 lb. of steam per KW.-hour. This was equivalent, however, to a thermo-dynamic efficiency of 68 per cent., which is considerably in excess of the thermo-dynamic efficiency referred to above, although the Willans-Parsons turbines were only of one-half the size. Further, subsequent turbines of the Willans-Parsons type have been set to work with a thermo-dynamic efficiency as high as 71 per cent.

It will be remembered that some extremely low steam consumption figures were quoted some time ago as having been obtained at the Carville station in Newcastle, the turbines in that installation being of the Parsons type and rated for an output of 5,000 KW. The lowest actual steam consumption obtained was 13·189 lb. of steam per KW.-hour, and this reduced to the thermo-dynamic basis gives an efficiency nearly as good as the 68 per cent. obtained by Messrs. Willans & Robinson, Ltd., on the Sydney turbines. It is certain, therefore, that some of the extremely low results guaranteed by turbines on the basis of pounds of steam per KW.-hour represent an economy which is misleading.

Those who have paid considerable attention to the question of reducing the comparison between different forms of steam turbine to the thermo-dynamic basis will be aware that up to now turbines of the impulse type have not been set to work which have surpassed the results obtained on a commercial scale with turbines of the Parsons type.

The Territorials.—It is announced in the *Times* that the London Corps of Electrical Engineers, commanded by Col. R. E. B. Crompton, C.B., is to have its annual training at Dover from July 3rd to 31st.

PROCEEDINGS OF INSTITUTIONS.

Comparisons between Steam, Gas and Oil Engines.

THE discussion on Mr. A. J. J. Pfeiffer's paper (see ELEC. REV., June 11th, p. 985) was opened by MR. J. H. RIDER, who said that in his comparison between the cost of local Diesel plants and an electrical sub-station system, the author had given the cost of 10 sub-stations as £175,000, a figure based on the cost of the L.C.C. Shoreditch sub-station, which was the most expensive in the system, the average cost being £4,000. He could not understand where the figure of ·089d. per unit operating cost for sub-stations came from; the actual figures for the L.C.C. sub-stations last year were: Oil, &c., ·001d.; salaries, &c., ·041d.; maintenance and repairs, ·007d.; making a total of ·049d. per unit. With regard to his estimated operating costs for the generating station, the author had quoted coal, oil, salaries and wages from his (the speaker's) paper, but had taken a figure three times as large for maintenance and repairs; correcting for this, with a 49 per cent. load factor, the author's ·316d. should be ·291d. per unit of output. In the speaker's paper, the operating figures given were for the first half of the Greenwich station, but since the extensions had been in use the cost per unit had been reduced to ·261d. per unit, and if this were allowed for, the balance would be in favour of the central station and sub-station scheme. Allowing for these differences, with a 33 per cent. load factor and oil at 60s. (not 50s.) per ton, the costs would work out at ·634d. per unit for the electrical sub-station scheme, and ·641d. per unit for the Diesel engine scheme. The steam figures were actual, but the oil figures were necessarily hypothetical. He would like to know how much water was required for the Diesel plants.

MR. W. B. ESSON said that only three years ago Messrs. Sulzer Bros. made their first 300-H.P. Diesel engine, a three-cylinder motor with fly-wheels, coupled to a 75-cycle alternator, which was supplied to the Hong Kong Electric Supply Co., and replaced steam plant; several other similar engines had also been installed, and the monthly average oil consumption was ·72 lb. per KW.-hour, with average loads of 125 KW. It was true that the oil was practically independent of load factor, and there were no stand-by losses, but the whole question depended on the amount taken for stand-by losses in the case of the steam engine, which, he considered, the author had greatly exaggerated. Even with its increased efficiency, it did not always pay to install Diesel plant; he (the speaker) recently considered the point in connection with a Calcutta installation. The ordinary oil engine weighed 87 tons and the Diesel engine 37 tons, but it was cheaper to use the ordinary engine on account of lessened cost and depreciation. As regarded oil cost, Messrs. Mirrlees, Bickerton & Day paid 55s. per ton delivered, and in London the cost was 51s. 6d., as compared with the author's 48s. per ton.

MR. H. L. DICKSON said that at the Leatherhead electricity works the generating cost with a small Diesel plant was ·27d. per unit, and repairs over three years only amounted to 40s. The engine cylinders were only cleaned once a year, and it was possible to start a 120-H.P. set in 45 seconds.

MR. H. W. HANDCOCK gave some additional figures in regard to the working of the Leatherhead plant. In 1905, with steam plant, the coal cost was 1·044d., and works cost 1·933d. per unit; in 1907, when the Diesel plant was introduced, fuel cost ·3245d. per unit and the works cost was 1·338d. per unit; in 1908 these costs were ·29d. and ·76d. respectively. The average price of fuel delivered at Leatherhead was (1906) 63s., (1907) 67s., (1908) 70s. and (1909) 66s. per ton. Oil fuel cost about 40s. per ton when the plant was started, but it was subject to great fluctuations. Turning to another station—Hindhead—in 1904, with coal and non-condensing engines, the fuel cost was 1·67d. per unit; with Diesel plant, in 1906 and 1907 the fuel costs were ·432d. and ·356d. per unit respectively. The Diesel plant required more skilled attendance than a steam plant, but repairs were practically nil; he thought gas-engine plant would run it close. Capital cost was a prime factor, and with short-term leases it might pay to use cheaper engines.

MR. H. M. SAYERS thought the Diesel engine had suffered by the lack of information about it, the high price—it cost as much as a good engine and boiler—and the uncertainty of the price of oil. The latter might shortly be settled, as the Diesel patents would lapse, and then the engine would cost less and be more used. There were many sources of oil fuel in this country; average bituminous coal would give about 70 gallons per ton, leaving gas and coke residuals. Lignite gave good oil, about three-quarters of its 65 per cent. of product being suitable for fuel; peat and shale were also possible sources of oil fuel.

MR. LEONARD ANDREWS said that the hypothetical curves of steam and gas plant efficiencies coincided with the actual results obtained and given in his (the speaker's) recent paper. He considered that the author's fuel costs for both gas and steam plant were wrong; for gas plants the average fuel cost should be nearer 12s. per ton, and taking the example given by the author, the figures for steam, gas and oil on this basis became respectively ·45d., ·348d. and ·374d. per unit. He was astonished that the author's figure of £23·5 per KW. for steam plant had passed unchallenged, after the criticism bestowed on his own figure of £14 per KW. some few weeks earlier.

MR. H. S. RUSSELL said that there was a large field open to the Diesel engine in supplanting steam plant at light loads. At Birkdale there were three 90-KW. sets, one being a Diesel set; with steam only, fuel, oil, wages, &c., amounted to 1·131d. per unit, but using the oil engine for 24 hours per day and the steam plant on the peak, this figure became ·615d. per unit. As regarded the engine, a single pump was used by most Continental firms, but at

least one British firm used a plunger for each cylinder, and this gave more certain results and allowed of closer governing. At Lewes a four-cylinder engine was in use, but only two cylinders were used in starting up; the fuel costs were ·24d. per unit with oil at 51s. 3d. per ton. The two-stroke-cycle engine was made in this country some years ago, but had been abandoned; the heating was the limitation in this type, and it meant reducing the speed by half, so that there would be no saving in cost. He thought a variation of $\frac{1}{100}$th not good enough for alternators. Engines would run smokelessly down to $\frac{1}{8}$ or $\frac{1}{10}$ full load, and if multiple pumps were fitted there should be no smoke. The author's Diesel engine costs were, if anything, high, and too much was made of the price variation of fuel, when one considered the effect of strikes on coal costs.

MR. W. H. BOOTH said that in tests made some time ago on Diesel engines using fuel of 19,300 B.TH.U. per lb., the fuel costs came out at ·69d. and ·449d. per unit for quarter and full load respectively. The fuel consumption was very regular, but the engine must be kept in good condition or difficulties arose. The steam engine would run anyhow, even uneconomically, and he was not sure that this was a good point of the latter. From tests made he had found 44 per cent. efficiency for the I.H.P. and 30 per cent. for the B.H.P. He thought there would be some economy, say, 3 per cent., if the exhaust were cooled. As regarded sources of oil fuel, hydro-carbons were found in clay as well as lignite in this country. As about three-tenths of the heat generated in a Diesel engine went into the water-jackets, it was an easy matter to calculate the water required for cooling purposes.

The author, owing to the late hour, decided to communicate his reply to the *Journal*.

We have received the following communication on the subject of the paper from Mr. C. Alfred Smith, B.Sc., Asst. Professor of Engineering, East London College:—

The discussion at the Institution of Electrical Engineers concerning the future of the oil engine for electric generating purposes showed quite conclusively that, if this form of prime mover is to be used for generating electricity in large cities, it will be adopted in sub-stations, and not in large central generating stations. Indeed, the most significant remark made during the discussion was the statement that already oil engines are being used in the City of London for this purpose.

Some readers of the ELECTRICAL REVIEW may remember that, in November and December, 1903, the writer contributed to that journal some articles in which it was suggested that a sub-station should be equipped with internal combustion engines instead of rotaries and transformers. The thesis was advanced that it was cheaper to transmit producer gas than electrical energy. Mr. E. Kilburn Scott challenged the thesis, and the writer promptly replied to him.* Unfortunately, Mr. Scott did not continue the debate.

In January, 1904, the writer read a paper before the Birmingham Local Section of the Institution of Electrical Engineers entitled "Energy Distribution to Sub-Stations."† In this paper a suggestion was made somewhat similar to that advanced by Mr. Pfeiffer in his contribution. Both of us have suggested sub-stations using internal combustion engines.

One speaker in the discussion went so far as to hint that the oil might be distributed from some central station in pipes to these local sub-stations. The writer advanced the suggestion five years ago that producer gas should be generated at a central station, and that the gas should be transmitted under an initial pressure varying according to the distance to be covered. It will be seen that in some respects the two schemes are very much alike, although there is no reason to suppose that oil can be transmitted as cheaply as producer gas.

The outstanding objection made by all speakers when dealing with the problem of oil fuel for internal combustion engines was the fluctuating price. It is, therefore, very difficult to attempt to compare costs of distributing oil and gas; but it may be of interest, now that the subject is again under consideration, to recapitulate a few of the advantages of using gas engines for sub-station purposes.

It will be generally admitted that producer gas of a low calorific value can be made (when ammonia recovery is included in the scheme) at a very low cost. Very cheap bituminous coal can be utilised. The fact that the South Staffordshire Power Gas Co. sell gas at 2d. per 1,000 cb. ft. is in itself sufficient evidence that this form of motive power will not be a very large item in the cost of running a sub-station. If the producer plant is situated some distance from the city, where the land rates and taxes are cheap, then the total cost of making the gas used for generating one Board of Trade unit in the sub-station works out at something less than one-tenth of a penny. In other words, the writer figures that the total cost of manufacturing 1,000 cb. ft. of gas at the producer central station is rather less than $\frac{3}{4}$d.—a figure to be expected from the consideration of the sale to the consumer of 1,000 cb. ft. for 2d. If producer gas is to be utilised for generating the electrical energy supplied to cities, this must be done by one of two methods:—

(*a*) In a large central electrical station, from which electrical energy is transmitted in the usual fashion to sub-stations.

(*b*) In a central station used only for gas manufacturing purposes; the gas is transmitted to sub-stations in the city area.

The great objection to the scheme (*a*) from the practical man would be that very large gas engines are not considered with favour for the parallel running of alternators. This disadvantage does not occur in scheme (*b*), if we take a sub-station of the size mentioned by Mr. Pfeiffer, for each unit is comparatively small, and direct current will be required for a great deal of the load. There is no objection concerning the smell from the exhaust of gas engines, because these prime movers are frequently to be seen in cities, and seem to give satisfaction. There would be no very great trouble concerning the high temperature of cooling water if the ordinary type of gas engine were used. If it were considered expedient to obtain a higher thermo-dynamic efficiency, there seems to be no reason why gas engines on the Diesel principle should not be considered, but, of course, in this case the increased cost of the engine, and the increased complications of water cooling, would be an important factor. It is not generally recognised that in order to transmit producer gas to a sub-station 5 miles away it is only necessary to use an initial pressure of 1½ atmospheres. The compressors necessary to supply gas to sub-stations (the total capacity of which is reckoned at 4,000 B.H.P.) require about 400 B.H.P.—assuming that the efficiency of the compressor is 80 per cent.*

To bring the two schemes into comparison, working costs have been estimated. The gas-producing costs are common to the two schemes, and are 0·27d. per unit, which leaves a figure of 0·215d. per unit additional for the electrical transmission scheme and 0·126d. per unit additional for the gas transmission method.

Anyone who carefully examines the figures shown in recent papers concerning the cost of generating electricity, whether by steam engines, turbines or oil engines, will see that the figures which are to be carefully contrasted are the fuel costs. In the paper read by Mr. Pfeiffer the cost of fuel per unit generated with a load factor of 25 per cent. was given as 0·305d. (page 25). The net cost of fuel for producer gas with ammonia recovery is about one-tenth of that figure.

Whenever the question of gas transmission has been debated there is always advanced the bogey of leakage. During the last five years, however, the coal-gas engineers have seen the advantage of transmitting gas long distances. In Snodland, Kent, the writer has seen a very neat plant at work, in which considerable economy has been gained by centralising the manufacture of coal gas at one station and transmitting distances of a few miles.

At Nuneaton high-pressure coal gas is also used. Coke-oven gas is sent from Camden to Trenton, N.J., a distance of 30 miles. At St. Louis, U.S.A., the Laclede Gas Light Co. have gone in for a very high-pressure scheme of gas transmission. The success of the Paris compressed-air scheme is well known. There is little trouble from leaky joints if the pipes are designed and laid properly. It is quite a common matter to have high pressures in hydraulic pipes through cities—a pressure of 1½ atmospheres is extremely small when compared to those of a high-pressure hydraulic service.

The failure of the Birmingham compressed-air scheme is always cited by the prophets of disaster. Because that scheme was a financial failure is no valid reason why all transmission schemes using a fluid under pressure should fail. It would be as easy to argue that because the now famous "stud" system of traction is being removed from the Mile End Road it has no right to run in Lincoln City—where it is quite successful.

Each year brings the internal combustion engine more keenly into competition with the steam plant, and the former must win in the end, because of its higher thermodynamic efficiency. While there is the prevailing uncertainty concerning the oil supply, producer gas will offer the greatest attractions to the engineer. It is quite true that it would not pay to scrap existing plant. It is, however, of considerable advantage to examine closely each suggested scheme. It is not the writer's desire to be dogmatic concerning the advantage of producer gas over coal and steam boilers. It is a question of a possible scientific development.

The difficult thing to understand is that gas and electrical engineers do not effect a great compromise. Imagine the delightful state of affairs when they agree to some such plan as the following: The electrical engineer takes all of his motive power for sub-station prime movers from the gas mains (at, say, 2d. per 1,000 cb. ft.). The gas engineer supplies gas of fairly low calorific value to the city. It is manufactured some miles from the centre of the area supplied, and is piped to sub-stations. Some of it is used for electrical generating purposes—the remainder replaces that pernicious poisoner of the atmosphere, the kitchen and domestic grate. The gas is not used for illuminating purposes—the electrical sub-stations and metallic-filament lamps do that so efficiently. The gas engineer finds that his load is increasing rapidly, owing to the increased load on the electrical sub-stations.

Thus will the city be benefited by cheap gas for domestic purposes, and cheap electricity for lighting and traction purposes. And it will be the city smokeless.

Physical Society of London.

AT the meeting held on May 14th, 1909, a paper on "A Bifilar Vibration Galvanometer" was read by MR. W. DUDDELL. The paper describes a new type of vibration galvanometer and a series of tests made upon it. In the instrument described the mass of the moving parts is reduced to a minimum, the moving coil being reduced to the two wires forming its two sides, similar to a bifilar oscillograph, but with this difference:—Whereas the bifilar oscillo-

* "Gas Pipe v. Copper: A Defence," by the writer, ELECTRICAL REVIEW, November, 1903.

† March 4th and 11th, 1904, ELECTRICAL REVIEW.

* In a leading article the American journal *Power* (November, 1904), commented favourably upon these suggestions.

graph is designed so as to make the damping aperiodic, the vibration galvanometer is designed so as to keep the damping as small as possible. A series of tests made upon the instrument showed that the total range of frequency was very large, namely, from about 90 to 1,900 cycles per second. The damping is very small, so that the resonance is very sharp. A series of measurements on the sensibility of the instrument showed that the sensibility to alternating current decreases very nearly inversely as the frequency for which the instrument is adjusted, whereas for direct current the sensibility decreases approximately inversely as the square of the frequency for which the instrument is adjusted, which is what usually takes place with direct-current galvanometers. The sensibility of the galvanometer for detecting small alternating voltages is reduced by the back E.M.F. of the instrument, and the paper concludes with a determination of the magnitude of the back E.M.F. in the instrument shown at the meeting. The advantages of the galvanometer are its simplicity, ease in tuning, wide range of frequency for which it can be tuned, high sensibility, negligible self-induction and comparatively small back E.M.F.

Mr. A. Campbell said that galvanometers of this type had been used at the Reichsanstalt for several years, and had given good results with frequencies as high as 2,500 cycles per second. There was no doubt that Mr. Duddell's pattern of the same type was much more sensitive than the instrument of the moving-coil type which he (Mr. Campbell) described in 1907. Blondel pointed out in 1900 that in an oscillograph there was no advantage in having more than one turn of wire, but this appeared to be only true when the mirror was very small. As a large mirror with plenty of light and good definition greatly improved the ease and accuracy of observation, he gave the preference to a moving coil of more than one turn, even though the single-loop instrument was highly recommended by Dr. Orlich. With a moderately large mirror one could obtain good definition of a dark line with a scale distance of 600 cm. Wien's vibration galvanometer with very small magnets and a minute mirror gave 70 mm. at 1 metre distance for 1 microampere at 100 cycles per second and had a resistance of 200 ohms. Mr. Duddell's curves were most instructive. He had verified experimentally the law which he (Mr. Campbell) had stated from theoretical considerations, namely, that with a given bifilar suspension (tuned to resonance) the sensitivity varies inversely as the frequency. The figures given tended to show that the shorter bifilars gave reduced sensitivity. With much shorter bifilars he had found great loss of sensitivity. In the moving-coil type with many turns the back E.M.F. was considerable, and might even double the effective impedance of the instrument and lower the volt-sensitivity accordingly.

Dr. J. A. Fleming said that if the galvanometer was sensitive to currents such as were obtained by rectifying trains of oscillations from condensers, it might be useful as an optical call in wireless telegraph stations.

Dr. Russell thought the author was the first to point out the importance of the back electromotive force due to the vibrating wires cutting the magnetic field. He showed that to a first approximation the author's results were in agreement with those deduced from the differential equation ordinarily given for the motion of the mirror.

The Author said that considerations of space prevented him from working with scale distances of 6 metres. With regard to Wien's instrument it was easy to obtain high current sensibility, but not high voltage sensibility. He had tried Prof. Fleming's suggestion, but his instrument was not sensitive enough for ordinary signals; with more uniform spark frequency it gave excellent results. In reply to Dr. Russell, he stated that the sensitivity of the galvanometer varied slightly with the barometric pressure. The frequency of ordinary supply circuits was quite constant enough for accurate work. In reply to Dr. Chree, he stated that the mirror was always symmetrically situated on the suspension.

A paper by Messrs. W. P. Fuller and H. Grace on the "Effect of Temperature on the Hysteresis Loss in Iron in a Rotating Field" was read by Prof. Marchant.

The rotating field was produced by means of two-phase currents. An iron disk 4 cm. diam., ·027 cm. thick, was supported by a bifilar suspension, and the torque measured by a mirror and scale in the usual way. The specimen was heated by means of nickel wire heaters placed above and below it, and the temperature measured by means of a thermo-junction placed close to the disk. The flux in the iron was measured by the voltage induced in a coil of eight turns of bare wire wound round it. To measure the voltage, the maximum value of which was of the order of ·03 R.M.S. volts, a special galvometer was constructed, depending for its action on the forces exerted by a rotating field on a suspended coil carrying alternating currents. The results of the experiment show that the effect of increasing the temperature of iron is to reduce the hysteresis loss at a given induction and to cause the maximum value of the loss to occur at a lower value of the induction. In one specimen the maximum value of the loss at 220° C. was 12,300 ergs per cm.^{3} per cycle at an induction of 16,000 C.G.S. units. At 580° C. the maximum loss was 2,600 ergs at an induction of 10,700. The frequency of the experiments was 42 cycles per sec.

A paper "On a Method of Testing Photographic Shutters," by Messrs. A. Campbell and T. Smith, was read by Mr. Smith.

The authors described a simple and rapid method of testing the speeds and efficiencies of photographic shutters, with a maximum error of 0·0001 second at the highest speeds. A vibrating beam of light falling through a narrow slit on a moving plate serves to measure the time. This beam is obtained by reflecting the light of a Nernst lamp from the mirror (area 50 sq. mm.) of a vibration galvanometer actuated by a current of fixed frequency (say, 100 or 500 cycles per second) obtained from a microphone hummer. The use of the vibration galvanometer, in which the amplitude is enormously increased by resonance, greatly facilitates the measurements.

When the total duration of exposure only is required, the vibrating beam of light is passed through the shutter, tracing a sine curve on the moving plate. The duration of exposure is immediately found by counting the number of ripples recorded on the plate. Ten records of the various speeds of a shutter can be taken side by side on one 5-in. × 4-in. plate in one minute.

When the efficiency in addition to the duration of exposure is required, a slit is placed in a diameter of the shutter opening, as close to the shutter leaves as possible, and an image of this slit is formed on the plate by the side of the vibrating beam of light. As the shutter opens the length of the slit through which light can reach the plate increases, and the record on the plate gives the length of the slit which is opened at every instant of time. Measurements are then taken of the area of the shutter aperture corresponding to a number of lengths of the slit-opening. Combining these records, the area of the shutter aperture at every instant of the exposure is obtained, and by integrating this area with respect to time the equivalent exposure at full aperture and the efficiency are calculated.

ELECTRIC LIGHT IN AN ANCIENT CASTLE.

One of the most ancient families belonging to our English nobility is represented by the Earl of Scarborough, whose home is at Lumley Castle, in the County of Durham, about two miles from the mining town of Chester-le-Street. The history of the family goes back to the time antecedent to the Norman conquest, and there still stands in the castle a statue of Liulph de Lomlei, a Saxon Thane, who exerted local influence in the time of Edward the Confessor. It can, therefore, be readily imagined that the castle itself is of very ancient date; the oldest portions of the structure appear to have been built in the time of Edward I, while successive alterations made in 1392 and 1690, and the comparatively recent modifications made in order to adapt the fortress to the standard of modern convenience, have brought about a juxtaposition of building styles which nothing but the originally massive proportions and bold scheme of building could have prevented from degenerating into confusion; as it is, however, Lumley Castle stands as one of the most ancient landmarks in the County of Durham.

Quite recently it was decided to add the latest advance of civilisation — electric light — to this feudal fortress, and the numerous problems connected with the enormous thickness of walls and other architectural difficulties, together with the necessity for sympathetic treatment from an æsthetic point of view, were admirably controlled by the consulting engineers, Messrs. Handcock & Dykes, of Westminster Chambers, London, S.W. They prepared a scheme by means of which current was obtained from Lumley Colliery, a distance of a quarter mile away, by means of underground lead-covered cables, led to a sub-station situated in one of the rooms on the ground floor of the castle. The colliery recently obtained a supply of electricity for lighting and power purposes from the County of Durham Electrical Power Distribution Co., Ltd., on the alternating-current three-phase system, the supply from colliery to castle being given through a twin armoured 1/16 cable at 5,700 volts pressure, at which the current is supplied in the castle through high-tension switch fuses to either of two 7-KW. three-wire transformers, converting to a pressure of 100 volts on either side of the three-wire system. The mid point of the L.T. system is earthed, and the wiring on either side of the system is concentric with the earthed outer. The contract for the lighting installation was given to Messrs. Thos. G. Usher & Co., of Newcastle-on-Tyne, and consisted of the installation of upwards of 250 lights, which will eventually be brought up to 350 lights. Close to the supply meters in the castle are fixed two triple-pole Berry, Skinner switch fuses, from which three-wire, paper-insulated, lead-covered and armoured mains are run to two distribution boards, one at each side of the castle. The armouring of the cable forms the earth of this section of the system, and is metallically continuous throughout. Across the inner courtyard of the castle these cables are run in wood troughing filled in solid with compound to points immediately below the distribution fuseboards, which are on the principal or first floor.

The interior lighting of the building has been carried out upon the "Kalkos" patent tinned tube wiring system, supplied by the Sun Electrical Co., Ltd. This has been used in preference to iron or steel tubes, because of the difficulty found in the humid atmosphere of these islands, that directly there is a sudden rise in temperature condensation is caused inside the barrel. Tinned brass tubes are found to follow more quickly the varying temperature of the air, and thus a tube system is obtained which will not sweat, and which is practically air tight. The tubing is used as return or neutral conductor throughout the installation, the three-wire circuit consisting of two insulated conductors inside the brass neutral. In decorated plaster or papered rooms the wire is sunk so as to be concealed, but the structural difficulties above referred to have in many instances necessitated the running of the circuit on the surface. In the servants' quarters

surface wiring is almost entirely adopted. As far as possible joints have been avoided by looping to switches, &c., but where joints were absolutely necessary, as in the case of fittings, "Kalkos" outlet boxes were used, the joints being soldered and insulated with six layers of pure rubber strip made up to at least the original thickness of insulation with tape, and the joint served all over with waterproof varnish. Particular attention was paid by the consulting engineers to this part of the work when inspecting the installation, as it was absolutely necessary that the slightest cause of complaint should be eliminated. The cable used for the sub-circuits was Helsby 2,500-megohm vulcanised-rubber single cable, C.M.A. class.

Exceptional care was taken that every part of the installation was capable of future overhauling, if necessary. The system is throughout of the drawn-through type, by which any wire can be drawn in or out at any time without disturbing the decorations, and the wires were drawn in after the pipes were fixed and the plaster made good. No more than three insulated wires have been drawn into each tube, and the neutral wires of all fittings have been efficiently connected to all the outlet boxes either by soldering or by substantial screw connections.

As a result, a high-class installation has been put into place. It was, of course, a matter requiring great judgment to choose those fittings which would harmonise with the general surroundings in which they were placed, and either steel, bronze, or brown bronze finish was given to the majority of the switches, brackets and other fittings. In one or two cases existing lighting fittings were adapted to take electric light, and one of the finest examples of this is to be found in the Baron's Hall, the oldest part of the castle, where a very fine Dutch candelabra, of historic interest, has been converted into a 30-light electric fitting by the use of patent Leuconium lamps supplied by the Stearn Electric Light Co., of Victoria Street, S.W. These lamps are of the metal-filament type with a carbon auxiliary filament, and a special fuse is provided in the cap of the lamp, in order to prevent the extinction of the light should the metallic filament fail, the carbon filament being switched in automatically when the metallic filament breaks. The rest of the fittings have been supplied by Messrs. Faraday & Son, of Berners Street, W., and their effect in such rooms as the dining parlour, the saloon, King James's room, and Lord Scarborough's private apartments, is very fine indeed. The ball room will be lighted by Linolite lamps, carried round the heavy cornice and throwing the light on to a very fine plaster ceiling, from which it will be reflected on to the floor below. A considerable quantity of current will be used for radiators and other electrical heating appliances, which are also being fitted.

It will be seen, therefore, that the difficult task of adapting the newest form of illumination to the home of the oldest direct line of Barons in England has been very successfully performed, and Messrs. Handcock & Dykes, who were responsible for the design and general arrangement of the installation, are to be congratulated on the result. It is interesting to note that by the adoption of a concentric three-wire system with earthed return, the advantages are obtained of a 200-volt supply, of considerable importance having regard to the long runs necessary to reach some of the points, together with full security and a very considerable saving in cable.

RECENT WORKMEN'S COMPENSATION CASES.

It might have been thought that in the time which has elapsed since the Workmen's Compensation Act, 1906, came into force, the questions arising with regard to it would have been satisfactorily settled. But this is not so. It is the source of an increasing flow of litigation in the County Courts. The fact that so many claims are disputed is the more surprising when one remembers that employers are for the most part insured against liability. Insurance companies, therefore, have to provide the sinews of the war. The fact that they find it prudent to bring cases into court would seem to show that the premiums charged are not sufficiently large to justify admission of liability in every case.

In view of the fact that employers in the electrical world are closely and seriously affected by this Act, it may be useful to summarise a few of the decisions of more general interest which have recently been arrived at in the County Courts and in the Court of Appeal. We shall not cumber our notes with many names of cases, but we can, if necessary, give closer reference to any case if any reader desires it.

The first case which comes to our notice is of interest to those who have occasion to send workmen abroad. If an accident happens abroad or in the colonies, is the employer liable? In a case heard in the Court of Appeal, Messrs. Pearson were constructing a breakwater at Malta. An English workman employed by them was killed at Malta, and his widow claimed compensation. It was held that the Act did not apply. Lord Justice Farwell stated that in so far as it applies abroad, the Act is limited, generally speaking, to seamen, and that it does not apply to other workmen outside the territorial limit.

It cannot be too often pointed out to those who desire to prefer claims, that the injury or death must be proved to be the result of an accident. Mere assumption will not do. In one case a seaman fell overboard from a ship in dock. His body was found floating close to the ship, but there was nothing to show what caused him to fall overboard. It was held that the widow could not claim, as it was not proved that the accident arose out of and in course of the employment.

As soon, however, as an accident is proved to have taken place, the employer becomes liable for the remoter consequences. So in another case, a man was injured by having his hand crushed between two rollers. By a skilful operation, a surgeon managed to save the hand. A second operation, however, became necessary, but the patient, unfortunately, succumbed to the anæsthetic. It was held that the employers were liable to compensate the widow, the Master of the Rolls observing that the true test was whether the step which was taken to obviate the consequences of the step was a reasonable step. Had the second operation been successful, the employer's liability would have been greatly diminished.

An employer's liability cannot be measured by the condition of the workman before the accident. So, in a case decided at St. Helen's County Court, a workman was injured by a piece of hot glass flying into his eye. Although it was proved that the eye was injured beforehand, the employers were subjected to the full measure of liability. It is to be observed, however, that, in the case of injury by accident, the measure of the employer's liability is the incapacity of the workman. In another case, decided at the Wigan County Court, a pitman had developed a squint as a result of an accident. He was paid compensation at half wages for some time; when the employers sought to have it diminished on the ground that the man's full capacity was restored. His own doctor admitted that in spite of the squint his working capacity was as good as before the accident. Upon this the judge terminated the weekly payments.

There have been several decisions with regard to agreements for compounding for weekly payments by the payment of a lump sum down. Such an agreement must be sanctioned by the Court: and the Court will not necessarily express its approval of an agreement which is satisfactory to the parties. In a case at Newcastle the father of an injured boy who had lost three fingers was willing to accept £70 in lieu of a payment of 7s. 2d. a week during incapacity. The judge refused to sanction this agreement because £70 was entirely inadequate. Further, it was decided in a Scotch case that the Court will not hesitate to set aside an agreement signed by a workman which purports to be in full discharge of all claims, if it be shown that the workman did not really understand the nature of the document which he signed.

The question who is a dependant of a deceased workman is of considerable importance to employers, inasmuch as if there are no dependants, liability is reduced to the vanishing point. It was held in one case that a wife remained a dependant, although she had been deserted by her husband for some three years prior to the accident. In another case, however, the wife had been deserted by her husband for some eight years. She had since lived with another man, and had had two children by him. It was held in these circumstances that she was no longer dependent, and was not, therefore, entitled to prefer any claim.

The question how far the employer is liable when a workman is injured, and subsequently dies, owing to the supervention of disease, is one which can only be answered by the medical evidence in each particular case. In a case at Newport, a man was ruptured by a strain. Five months later he died of cancer. One medical man expressed the view that the cancer was accelerated by the rupture; but on the balance of the medical evidence, the judge came to the conclusion that death was due to cancer and not to the accident. The claim was, therefore, dismissed. In another case at Doncaster, a man was injured by a fall in July, and died in December of tuberculosis. It was proved that there was some latent tuberculosis present before the accident. Medical witnesses called on behalf of the widow, said that the accident stirred this up into activity, and so caused the death. In these circumstances the employers were held liable. With this may be contrasted a case heard at Durham, where a boy, who was injured in January, died of consumption in August. A post-mortem revealed the fact that the boy had suffered from consumption for a considerable time, and the judge, acting upon the medical evidence, came to the conclusion that this was the cause of death. A claim by the father for compensation was accordingly dismissed.

It should be remembered that unless a disease is an "industrial disease" within the meaning of the Act, an employer is not liable; unless, of course, it can be shown that the disease (such as consumption) is directly due to a physical injury. For instance, in a case at Droitwich, it appeared that the deceased was overcome by coal gas while repairing gas pipes. It was held that even assuming the man was killed by gassing, this was not an industrial disease, in respect of which the employers could be held responsible. As in illustration of that class of case in which fatal disease is the necessary consequence of accident, mention may be made of a case at Bradford in which a quarryman was injured by a small piece of shale cutting his finger. Blood poisoning followed, with the result that the arm had to be amputated. The employers were held liable.

Of all the cases which have recently occupied the attention of the Courts, those relating to compulsory operations are the most interesting. It is now clearly established that if an operation which is attended with no risk will restore to a man his power of working, he must either undergo it or else suffer the loss of compensation. It is hoped that the Legislature will not interfere with this most salutary rule which has been made by the judges of the Court of Appeal. It is necessary, however, to understand the exact extent of the rule. In one case recently heard in the Court of Appeal, a man had sustained a double rupture, in respect of which he claimed compensation. A number of medical witnesses expressed the view that an operation would be unattended with risk,

and would restore his power of working. The man's own doctor, however, was of opinion that as the applicant was suffering from Bright's disease the operation would be dangerous. The Master of the Rolls pointed out that this was quite sufficient to justify the refusal to undergo the operation. The question was whether the man was reasonable or not, and "after the evidence of the man's own doctor no amount of other medical evidence was relevant to this question." In view of this statement of the law, it is clear that grave responsibility rests upon the medical man who is called upon to advise an injured workman.

The Court of Appeal has frequently ordered payment of compensation to be suspended while the applicant unreasonably refused to undergo an operation. Again, where it was shown that a man could work if he wore a truss, the weekly payments were suspended until he adopted this simple means of enabling himself to work.

An important point which distinguishes the Act of 1906 from that of 1897, has recently been brought into prominence in a case before Judge Ruegg at the Stoke County Court. As our readers are aware, the Act of 1897 excused the employer from liability if the accident were due to the "serious and wilful misconduct" of the workman himself. The Compensation Act, 1906, also has this proviso, but subject to the material alteration that the employer shall be liable if the injury to the workmen is of "a serious and permanent character." In the case in question a miner had been guilty of a breach of rules which the judge held was serious and wilful misconduct on his part. After hearing much medical evidence as to the man's condition, the judge referred the matter to a medical referee, who found that the injury was of a serious and permanent character. The applicant, therefore, was entitled to an award. His Honour said: "By 'serious and permanent' I do not understand the Act to mean that it must necessarily be a life-long injury; but the injury was such that the effects would not be temporary, and was therefore correctly described as permanent."

NEW ELECTRICAL DEVICES, FITTINGS, AND PLANT.

The "Ordnance" Time Limit Device.

The Electric & Ordnance Accessories Co., Ltd., of Chester Road, Aston, Birmingham, have applied for letters patent in respect of a new time limit device for controlling the operation of circuit-breakers, of which particulars are given below.

The device consists essentially of a partially toothed quadrant gearing with an escapement, which allows the quadrant to move

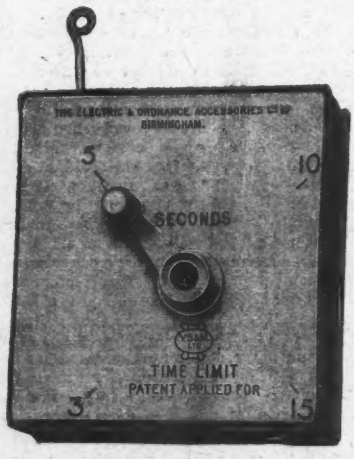


Fig. 1.—"Ordnance" Time-Limit Device.

only at a certain speed until it becomes disengaged and so releases the breaker, or until the load becomes normal again.

Tests made with an instrument set for eight seconds showed that with a pull of 1 lb., release took place in ten seconds, and with a pull of 3 lb., in six seconds. Should it be desirable to release the breaker instantaneously on a dead short circuit, the device can be fitted with an attachment to effect this end, which, of course, does not operate on ordinary overloads.

The general external appearance of the instrument is shown in fig. 1, while fig. 2 shows a circuit-breaker (2,500 amperes) fitted with one of these time limits.

It will be seen by reference to fig. 1, that the device is calibrated for four time lags, a feature which, it is claimed, is unobtainable in any other time-limit device at so low a price as the "Ordnance." This enables the user to choose any time limit the conditions of service may require, and to alter it when he deems it advisable, without reference to the manufacturers. The instrument, of course, can be calibrated for any other periods than those shown in

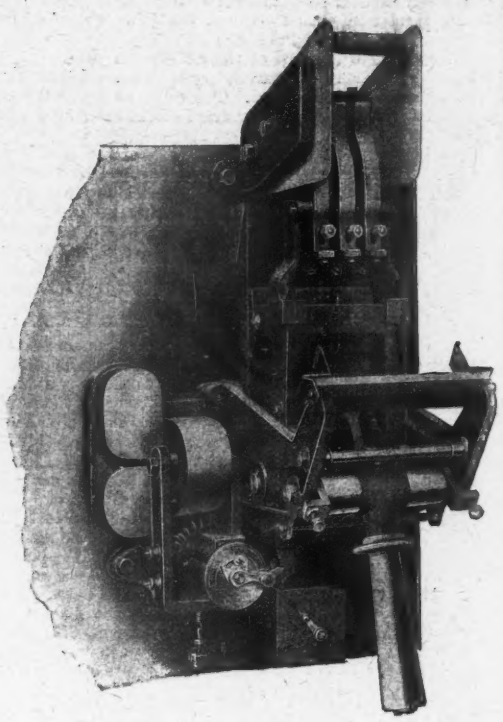


Fig. 2.—Circuit-Breaker Fitted with Time Limit Device.

the illustration. It is claimed for the instrument that it is extremely simple, compact and reliable, and that it will always operate after the same interval of time to within a small percentage.

Harrison Patent Switch-Fuse.

A novel type of switch-fuse has been brought out by Mr. Haydn Harrison, of 11, Victoria Street, S.W., and is illustrated herewith; the special feature of this device is that the fuses are screwed into a cross-bar, which is given a half-turn by means of a handle or key to switch on or off, the moving contacts consisting of the heads of the fuses themselves (fig. 3). In the event of an overload the fuses break the circuit without arcing, and the fuse wire can readily be renewed. The combination of switch and fuse makes for simplicity and

Fig. 3.—Detail of Fuse Carrier.

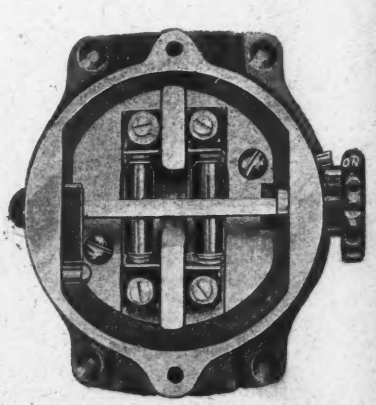


Fig. 4.—10-ampere D.P. Switch-Fuse, with Cover Removed.

economy both in first cost and in labour. The insulation employed consists only of porcelain and ebonite. There is no risk of shock when unscrewing the fuses. The switch action provides for quick break, with definite on and off positions, and can be operated with a handle, as shown, or a removable key. The type illustrated in fig. 4 (the standard pattern) is supplied enclosed in a water-tight cast-iron case with machined cover, screwed top and bottom to fit tubing according to specification. Patterns are also made with a sealing chamber for cables.

Oerlikon Electro-Hydraulic Riveter.

An interesting application of electric power in combination with hydraulic mechanism is shown in the accompanying illustration of the portable riveter of the Maschinenfabrik Oerlikon (G. Wüthrich), Oswaldestre House, Norfolk Street, W.C. The hydraulic system, with its enormous force and uniform motion, is ideally adapted to riveting, while the electric cable is the ideal means of conveying power to the machine; the advantages of both systems are utilised by employing an electric motor to drive a pump carried on the riveter itself. The frame is a strong steel casting, with a gap 30 in. deep and 16 in. wide; the hydraulic cylinder forms part of one of the jaws. The motor is of 4 to 6 H.P., and runs at 1,420 R.P.M., driving through worm gear and connecting rods a reciprocating pump of the differential piston type, making 170 strokes of 1½ in. per minute. The cylinder is built for a maximum riveting pressure of 90,000 lb., and is capable of dealing with rivets up to ⅞ in. in diameter; the outward speed is 16·5 in. per minute, and the return stroke 70 in. per minute. A small reservoir is provided for the liquid (a mixture of glycerine and water with low freezing point), from which the pump draws its

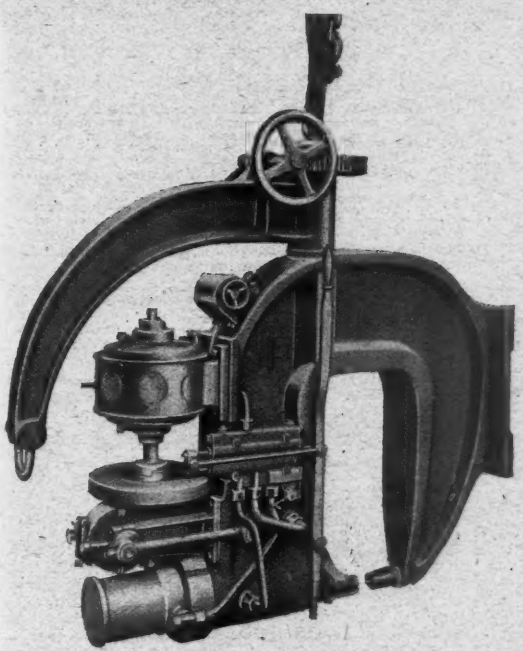


Fig. 5.—Electro-Hydraulic Riveter.

supply; when the controlling lever is in the central position the water is returned to the reservoir, but on moving the lever to the working position, the pressure rises steadily, and can be maintained on the rivet as long as desired, the excess of liquid when the rivet is closed being returned to the reservoir through an adjustable spring-controlled valve. A float fitted with packing rings rises and falls in the reservoir, and keeps the liquid constantly fed to the pump, in spite of the varying quantity in the reservoir, no matter to what angle the riveter is tilted. The machine weighs 2,750 lb., and with three men, during an ordinary 10-hour run, it has put in 1,000 ¾-in. rivets. It can be used anywhere, slung from a crane hook, and can, of course, be coupled up to the supply circuit at any point, while a mishap to one riveter will not affect others on the same circuit. The pressure and time of dwell on the rivet are adjustable to suit the size of the rivet, an advantage which, it is claimed, this riveter alone possesses.

A similar type of riveter is made for use as a stationary riveter in boiler works, &c., in very much larger sizes, in which a sheet closer is arranged concentrically with the snap.

OUR LEGAL QUERY COLUMN.

[Questions addressed to this column should be written on one side of the paper only.]

"Ampere" writes:—"We propose lighting a small town in Ireland, and would be glad to know whether a provisional order would be necessary, or, if not, what advantages would accrue to us in procuring one. We understand that it would enable us to keep out all possible competitors. The urban authority is favourable to the town being lighted, but is indisposed to go to any expense in connection with the scheme. Would it be necessary for an urban authority to obtain a provisional order before giving a firm permission to sell current and erect poles, &c., in the town? We would be much obliged for a reply to the foregoing queries, and would be glad to have the name of a good book dealing with the law on the subject."

*** There is no necessity to obtain a provisional order. Anyone can supply electricity without an order, provided he complies with (*a*) the requirements of the Board of Trade with regard to overhead wires, &c.; (*b*) the requirements of the local authority as to running wires under or over highways. One advantage of a provisional order is that it specifies a minimum charge for light which the holders may demand. A provisional order confers no monopoly; anyone else could set up a private supply in the area affected. The urban authority need not obtain an order before giving the necessary permission.

The subject is dealt with in "Emden's Building Contracts" (4th edition), p. 347 (Butterworth & Co., Bell Yard, London, E.C.).

L.G.B. INQUIRY AT WEST HAM.

As stated in our last issue, the Local Government Board inquiry, presided over by Mr. H. Ross Hooper, M.Inst.C.E., into the application by the Corporation of West Ham to borrow £74,600 for the purposes of the electricity supply undertaking, was resumed on Wednesday, the 16th inst. Mr. R. Elvy Robb again appeared for the India-Rubber, Gutta-Percha and Telegraph Works Co., who opposed the application, and Mr. Drucker, instructed by Mr. Tweedy Smith, for several local wiring contractors who felt that the wiring department of the undertaking unfairly interfered with their business. The Corporation were represented by Mr. Edward Morten, K.C., and the principal officials.

The Inspector, in opening the day's proceedings, pointed out that, in his opinion, the questions as to the financial results of the past working of the undertaking, asked on the previous day, were revelant to the inquiry, for the essence of the successful working of the undertaking was the financial result, and that was the only justification which could be given for the further large loan on capital account now required.

The statement as to the working results of the sales and wiring department, which had been promised on the previous day, was handed in, Mr. Patterson, the borough treasurer, distinctly stating that he had not had time to closely examine it, and would not, therefore, vouch for its accuracy. He, however, stated that in future these separate accounts would be kept and presented at the same time as the annual financial statement.

Mr. Drucker asked a number of questions both of Mr. Patterson and of Mr. Holmes, the manager of the sales department, as to the present system of working, but he failed to elicit any definite information as to what wiring work had been carried out. Mr. Holmes could not say how many installations had been carried out during the past year, or what rate of profit had been earned; he, however, said sufficient records had been kept to enable him to say that they did not work at a loss. They had carried out several installations outside the borough, but the practice had now been discontinued.

The sales department had been reorganised during 1907, and the system of assisted wiring at present in force, under which the consumer paid 25 per cent. before the work was commenced, and the balance in eight quarterly instalments, has proved a success. It was admitted by Mr. Patterson that the plan previously in existence some years, under which payments were spread over a period of ten years, had proved unprofitable and had for some time been discontinued.

Mr. Drucker then proceeded to inquire as to the methods used by the department to get business, and produced some cable quotations sent out by the department early in 1903, which, he said, were lower than prices quoted by manufacturers to the trade. In support of this statement he called Mr. Troup, of the firm of Messrs. Troup, Curtis & Co., who were wiring contractors in the borough.

Mr. Troup gave evidence as to the low prices offered by the department, and stated that he ordered 180 yards of 7/21½ cable at the quoted price. The cable supplied was said to be of Messrs. Siemens's make, and though an attempt was made to charge a higher price the claim was withdrawn, and the transaction was closed on the quoted terms. Pieces of this cable were sent to Messrs. Siemens, who repudiated manufacturing it. This was later substantiated by Mr. Huddleston, Messrs. Siemens's representative, who pointed out that the cable differed materially from British practice, and was, in his opinion, of Continental make. The fact that the price charged for the cable was lower than those charged by members of the Cable-Makers' Association to the trade was supported by Mr. Coxell, clerk to Messrs. Troup, Curtis & Co. The cross-examination of these witnesses by Mr. Morten was deferred till a later stage of the inquiry.

Mr. Elvy Robb opened the case on behalf of the India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd. He stated that his clients were large ratepayers, contributing not less than £7,000 per annum to the local rates, and as such were deeply interested in the prosperity of the undertaking. They were also as electrical engineers anxious that nothing should be done to discredit the industry. They had looked into the published accounts of the undertaking, and into the possibility of supplying energy on a profitable basis at the low rate of 0·37d. per unit, and their engineer, Mr. Stuart Russell, M.I.E.E., had come to the conclusion that this could not be done with fairness to other consumers. This opinion was upheld by Mr. W. H. Patchell, M.I.E.E., who would also give evidence on the question. As regards the recently-published accounts, he would point out that the undertaking was only rated at £250, whereas the new assessment was £12,900. If this were taken in the future, the rates, instead of being about £116, would at 9s. in the £, be over £5,600, a difference which would go far to swallow up any surplus calculated on the present basis.

He considered the selling price of 37d. and even 43d. per unit, which was stated to be the average price per unit for the 5½ million units sold in the Silvertown district was too low, and he would put in carefully-prepared figures calculated on the actual results of working at West Ham to prove this. These figures were prepared on the basis that each consumer ought to pay his share of capital charges on the basis of the ratio of his maximum demand to the maximum demand of the station provided there was no diversity factor.

Mr. Robb stated that proper depreciation charges should be allocated each year, as bearing in mind the practical abandonment of the Abbey Mills station, the reserve fund of £2,017, or about ½ per cent. of the total capital outlay, was quite inadequate.

After some discussion as to evidence as to cost of additions to electricity supply stations, given by Mr. Seabrook last year before the Parliamentary Committee on the London Power Bills, the inquiry was adjourned till Monday, July 5th, when the various estimates of cost will be fully examined.

FOREIGN AND COLONIAL TARIFFS ON ELECTRICAL GOODS.

DOMINICAN REPUBLIC.—Consular invoices are necessary for all goods shipped to the Dominican Republic. Invoices must be delivered in quadruplicate in the Spanish language to the Consul or his representative, and must contain the following particulars: The name of the shipper and owner of the merchandise; the name of the person or consignee; the place in which the goods are embarked, and the port to which they are consigned; the class, nationality and name of the vessel, and that of the captain; the marks, number and gross weight of each package; the net weight, measure and quality of the contents of each package, with an indication of the number of pieces of wrapper of each kind contained therein; the true value of the merchandise according to the quotation of the market at the time of presenting the invoices.

At the foot of the invoices the following declaration must be made and signed by the firm:—

Declaro que los bultos qui figuran en esta factura han sido comprados in Inglaterra para consumo en el Territorio de la Republica Dominica y que el contenido valor y pesos estan correctamente espresados.

Londres. 19.....

(*Translation.*)

I declare that the merchandise referred to in this invoice has been bought in England for consumption in the Republic of Dominica, and that the value and weights have been correctly given.

London. 19.....

Dollar = 4s. 2d.

An *ad valorem* duty of 73·8 per cent. is levied on the following goods imported into San Domingo, the values on which duty is calculated being as shown below.

Steel in bars and ingots	$10 per 100 kg.
Turpentine	$ 80 per gallon.
Wire, if iron plain	$·10 per lb.
Wire, if copper or brass, yellow or white ...	$ 30 per lb.
Tar	$3 per barrel.
Lamp shades, if glass, plain or otherwise ...	$2 per pair.
" if crystal, porcelain, or alabaster	$6 per pair.
Pitch	$4 per barrel.
Steam boilers	Free.
Bells of all classes and sizes	$50 per 100 kg.
Glassware not specified in the tariff	According to declaration.
Petroleum (kerosene)	$·15 per gallon.
Instruments not specified in the tariff	According to declaration.
Machinery not specified in the tariff	According to declaration.

In the case of certain goods, specific duties are payable as follows:—

Copper in bars or sheets	$5 per 100 kg.
Iron, unmanufactured, unwrought	$1 "

The following goods are free of duty:—Agricultural machinery and machinery for manufacturing industries, lubricating grease or tallow, machinery and instruments for scientific purposes, pumps, other articles for use of local manufacturing establishments.

Goods not separately mentioned would pay a duty of 73·8 per cent. *ad valorem*.

In addition to the Customs duties, there are certain internal taxes imposed upon imported merchandise by the general Government and by municipalities, with the approval of Congress.

Carbide of Calcium.—The over-production of carbide of calcium in Germany is compelling the works to restrict the output, and as a consequence the sales of electrodes are being unfavourably affected. The carbon factories which turn out electrodes for the carbide works are having to work on these articles for stock for the first time for several years past.

NEW PATENTS APPLIED FOR, 1909.

Compiled expressly for this journal by W. P. THOMPSON & Co., Electrical Patent Agents, 322, High Holborn, London, W.C., and at Liverpool and Bradford, to whom all inquiries should be addressed.

13,260. "Improvements in methods of charging and discharging secondary batteries or electric accumulators." A. M. TAYLOR. June 7th.

13,263. "Improved electrolytic meter." G. S. CATTELL and G. HOOKHAM. June 7th.

13,265. "Stage arc lamp." T. FRANCIS. June 7th.

13,268. "Improvements in liquid resistances." A. DITTMAR. June 7th.

13,295. "Improvements in or relating to electric furnaces." H. NATHUSIUS and WESTDEUTSCHE THOMASPHOSPHAT G.m.b.H. (Application for Patent of Addition to No. 7,188/08.) June 7th. (Complete.)

13,332. "Improvements in and relating to automatic signalling and checking apparatus for railway signals." I. VON KOVOTKIEWITSCH. June 7th.

13,343. "Smoke-actuated and heat-actuated electric fire alarm." A. W. TURNER. June 7th.

13,391. "Improvements in or connected with incandescent electric lamps of the Nernst type." A. CLARKE. June 8th.

13,407. "Improvements in clutches for electric automobiles and the like." C. M. DE SAINTE-CLAIRE. (Date applied for under Sec. 91 of the Act, November 16th, 1908, being date of application in France. Application for Patent of Addition to No. 13,234, 1909.) June 8th. (Complete.)

13,433. "Improvements in and relating to electric fuses." O. ENGEL. June 8th. (Complete.)

13,442. "Improvements in electric switches and switch fuses." H. H. BERRY. June 8th.

13,443. "Improvements in protected or armour-clad electric switch fuses." H. H. BERRY and W. J. MARKHAM. June 8th.

13,473. "Improvements in mercury or metallic vapour lamps." H. A. KENT. June 9th.

13,509. "Improvements in spark coils." E. WILSON and W. H. WILSON. June 9th.

13,523. "Improvements in electric alarm clocks." W. SCHRODER. (Date applied for under Rule 13, February 3rd, 1909. An invention comprised in No. 2,596, 1909, dated February 3rd, 1909.) June 9th.

13,526. "Improvements in or relating to magnetos, more particularly intended for the purposes of ignition in internal combustion engines." F. L MUIRHEAD and A. H. SMITH. June 9th.

13,527. "Improvements relating to electric incandescent lamps." H. S. STONEHAM. June 9th.

13,528. "Improved method of resuscitating electric accumulator plates." J. M. GORHAM, B. M. DRAKE and D.P. BATTERY CO., LTD. June 9th.

13,539. "Improvements in electrical accumulators." G. STOKER. June 9th.

13,542. "Improved process and apparatus for electro-therapeutic treatment." N. TSCHERKASSOFF. June 9th. (Complete.)

13,560. "Improvements in and relating to dynamo-electric machines." A. H. MIDGLEY and C. A. VANDERVELL. June 9th.

13,573. "Improvements in and relating to the generation of currents." E. C. R. MARKS. (J. L. Milton, United States.) June 9th. (Complete.)

13,590. "Improvements in or relating to electric starting and regulating switches." G. O. DONOVAN. June 10th.

13,612. "Improvements in the joining of metal to porcelain or other non-conducting materials as applicable to electrical and other work." R. W. KEMBLE. June 10th.

13,655. "Improvements in and relating to switchboards for electrical installations." BRITISH THOMSON-HOUSTON CO., LTD., and G. RICHARDSON. June 10th.

13,656. "Improved method of and means for operating electric switches for lighting railway trains." F. J. BEAUMONT. June 10th.

13,661. "Improvements in electric contacts." A. SCHWEIGER. June 10th (Complete.)

13,701. "Improvements in methods of charging and discharging secondary batteries or electric accumulators." A. M. TAYLOR. June 11th.

13,728. "Improvements in electric arc lamps." F. W. E. SCHUER. June 11th.

13,734. "Improvements relating to controlling mechanism for electric motors." W. E. LAKE. (F. Bissel Co., United States.) (Date applied for under Rule 13, January 12th, 1909; an invention comprised in Application No. 758, 1909.) June 11th. (Complete.)

13,749. "Improvements in telephone exchanges." SIEMENS BROS. & Co., LTD. (Siemens & Halske Akt.-Ges, Germany.) June 11th. (Complete.)

13,750. "Improvements in telephone exchanges." SIEMENS BROS. & Co., LTD. (Siemens & Halske Akt.-Ges., Germany.) June 11th. (Complete.)

13,762. "Improvements relating to alternating electric current distribution systems." J. S. PECK. (Date applied for under Rule 13, July 15th, 1908. An invention comprised in Application No. 15,047, July 15th, 1908.) June 11th.

13,763. "Improvements relating to alternating electric current distribution systems." J. S. PECK. (Date applied for under Rule 13, July 15th, 1908. An invention comprised in Application No. 15,047, dated July 15th.) June 11th.

13,771. "Improvements in telephones." C. ADAMS-RANDALL. June 11th.

13,786. "Improved method and means for fixing electric conductor wires on insulators." C. LINKE. June 11th. (Complete.)

13,823. "Electric railway signal." A. A. NORRIS. June 12th.

13,827. "Improvements in or relating to the transformation of electrical energy into heat energy." C. O. BASTIAN. June 12th.

13,831. "Improvements in electric relays for railway signalling and other apparatus." R. M. ABRAHAM and BRITISH PNEUMATIC RAILWAY SIGNAL CO., LTD. June 12th.

13,842. "Improvements in electric arc lamps." W. R. RIDINGS. June 12th.

13,851. "Improvements in electric signalling apparatus for use on and in connection with railway locomotive engines and the like." IMPROVED RAILWAY SIGNALS, LTD., and A. C. BOUNEVIALLE. June 12th.

PUBLISHED SPECIFICATIONS.

Copies of any of these Specifications may be obtained of Messrs. W. P. THOMPSON & Co., 322, High Holborn, W.C., and at Liverpool and Bradford; price, post free, 9d. (in stamps).

1908.

STORAGE BATTERIES. W. C. H. Montgomery and J. J. Young, R. E. Hellyer, and R. J. E. Paker. 27,883. December 2nd.

INSULATION OF THE LAYERS OF WINDINGS OF ELECTRO-MAGNETIC APPARATUS. Firm of R. Bosch. 28,442. December 30th. (Date applied for under International Convention, December 12th, 1908.)

MANUFACTURE OF ELECTRIC CABLES AND THE LIKE, AND OF MATERIAL FOR USE THEREIN. E. S. A. Cohen, P. A. M. Cramer and W. Geipel. 10,595. May 14th.

Cancelled

THE

ELECTRICAL REVIEW.

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THE

UNIVERSAL ELECTRICAL DIRECTORY

(J. A. BERLY'S).

1909 EDITION

H. ALABASTER, GATEHOUSE & CO.,

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MUNICIPAL ELECTRICITY SUPPLY.

WE take it that the Presidential address delivered by Mr. S. L. Pearce, chief electrical engineer to the Manchester Corporation, before the Municipal Electrical Association, may be regarded as fairly expressing the views of the municipal electrical engineer of to-day upon the many important subjects touched upon; it is true that the author makes no such claim, but as the engineer and manager of the largest municipal electrical undertaking in this country, perhaps in Europe, and President of the I.M.E.A., he occupies a position of exceptional authority, and his remarks should command the attention of the electrical world within our boundaries.

Touching first upon domestic affairs, Mr. Pearce claims that the Association has, to a considerable extent, realised the aims of its founders; we should be the more ready to agree with this view, if, in addition to the 176 "Engineer Members," the roll of the Association embraced a larger proportion than a mere eight Associate Members, and only 36 Associates (a diminishing number) out of a total membership of 390, and a possible membership of at least 1,000. The larger Institutions recognise that their vitality and growth depend in no small degree upon the prosperity of their Students' Sections, a feature which appears to be lacking in the case of this Association. Is not this an unhealthy condition, and would it not be advisable to take measures to remedy the deficiency?

Turning next to finance, the President points out that since 1897, when the second annual Convention was held in Manchester, the capital invested in municipal electricity works has increased from 3½ millions to the gigantic figure of £83,860,000—an enormous advance, indeed; this, together with the fact that practically the whole of the plant originally installed at Manchester by Dr. Hopkinson has now been replaced by newer designs, naturally leads to the consideration of the financial stability of the industry under the municipal *régime*, a matter which Mr. Pearce regards as the most important aspect of a committee's policy. We do not wonder that he insists upon the necessity of providing for renewals of plant before making contributions to the rates; he says: "It is now generally accepted that in so far as the statutory sinking fund instalments unaided will not provide for the redemption of the loans for short-lived assets by the end of the term fixed by the sanctioning authority, some additional charge against revenue is necessary, to provide for either the repayment of the balance of the loan then outstanding, or a corresponding part of the cost of the renewal of these assets. It is desirable that this supplementary charge on revenue should be annually apportioned." This is sound finance; we cordially welcome the support of Mr. Pearce to the policy for which we have for so many years contended. Our attitude, we know, has frequently been interpreted as one of hostility to municipal enterprise, though we have repeatedly repelled the charge. To legitimate

municipal trading, on sound and safe lines, we do not take exception; but we have consistently opposed the incessant attempts to treat the sinking fund as an adequate provision for depreciation and obsolescence of plant, of which the Manchester undertaking presents so striking a series of examples—first belt-driven dynamos, then direct-coupled steam dynamos, then direct-coupled steam alternators, and finally, the largest steam alternators of their kind in the kingdom, have successively become out of date, to say nothing of switchgear, motor-generators, mains and other important and costly items—all within 16 years! Well may Mr. Pearce say, "Too often, it is feared, moneys are taken in relief of the rates which should have been applied in provision for renewals or depreciation." We, at any rate, have done our best to advocate a sound financial policy, and we rejoice to learn that the views we have put forward are now generally accepted.

Whether the object of municipal undertakings should be to supply at or near cost price, or to make a profit for the relief of the rates, is, as Mr. Pearce says, arguable. It is also a subject upon which an immense amount of nonsense has been uttered, by municipal politicians whose lack of knowledge has been equalled only by the emphasis of their contentions. We used to be told that "in a few years' time this magnificent undertaking will be free from debt, and vast profits will be made for the benefit of the citizens." Even the use of the word "debt" has been cavilled at—"borrowed capital" sounds so much better. But it is the same thing, and just as all other capital needs renewal, so capital borrowed by municipalities must be renewed continually—freedom from debt is but an aspiration, destined never to be fulfilled. We incline to the opinion that electricity should be supplied at the lowest rates compatible with due provision for depreciation and antiquation, together with the formation of a substantial reserve fund to meet contingencies. Those who contribute most heavily to the rates, and who would, therefore, benefit most by the allocation of profits to the latter, are also those who consume the largest amount of electrical energy and employ the greatest number of persons; the supply of cheap energy, like cheap water supply, is of great benefit to the community, and it is very questionable whether the few shillings that a small tradesman would gain through contributions to the rates from the electricity department would be at all comparable with the advantages that he would derive, directly and indirectly, through the supply of cheap energy. As for the small householder and the working man, in many cases they would gain nothing at all from the alleged "relief" to the rates, which are often paid by the landlord.

Mr. Pearce next deals with the effect of the metallic-filament lamp upon the industry, and here again we agree with his view that it will eventually prove wholly beneficial, though, for a time, its benefits may be partially disguised, from the station engineer's point of view. Plant will be set free to supply power, and the load factor will benefit by the relatively increased proportion of the power load. To increase the price of energy would, as Mr. Pearce remarks, be a very questionable policy.

Touching on the proposition that has been under the consideration of the Association (and the I.E.E.) lately—the introduction of regulations permitting of cheapened systems of wiring—Mr. Pearce expresses the view that the use of flexibles above a given height from the ground, except where wires pass through walls or floors, is not inconsistent with the maintenance of the present standard of safety, a condition essential to the adoption of any such system; he also points out that economies can be made by increasing the limit for the number of lamps to be installed on a two-wire service, so as to avoid the expense and inconvenience of wiring a house on the three-wire system, and by increasing the number of lamps permitted on a single circuit. Obviously, the introduction of high-efficiency lamps has made all such rules out of date, and in future they had better be formulated on a basis of amperes instead of lamps.

As may be supposed, the chief electrical engineer to the Manchester Corporation has not overlooked the importance of power supply, to which, he thinks, electrical undertakings will chiefly have to look in the future for their development. While acknowledging the importance of inquiring whether the prices obtained are remunerative, lest an undertaking should find itself landed in a critical position, he believes that the majority of power tariffs are framed on a remunerative basis, and gives his approval to the theory that where extensions of generating plant have been necessitated by the growth of the power load, and have been carried out at the cheap prices now possible, the power users should only be required to pay a correspondingly small proportion of the capital charges. This appears reasonable, provided that the whole of the power users get the benefit of the low rates. Mr. Pearce seems to hold that the particular power users whose demand has led to the increase in plant should have the preference in this respect, a view with which we cannot agree, and which, we believe, would be illegal if put into practice.

The advantages of co-operation between large and small municipalities are touched upon in the address; there is no doubt that in very many cases the small authorities would be well advised to purchase energy in bulk from their bigger neighbours or from power companies, and many of them have already learnt the wisdom of this course. Lastly, Mr. Pearce emphasises the necessity for the municipal electrical engineer to look after his status; there is no doubt that attempts are being made to belittle his importance, and not only in his case, but in that of every engineer, the question of status is assuming greater and greater moment.

Limitations of space forbid further reference to the interesting points raised in Mr. Pearce's address, which should provide food for serious thought amongst electrical engineers in general.

Our Annual Tables.

The issue to-day of our Table of Electricity Works of the United Kingdom completes the annual dose of statistics and data that we serve up for our readers. The number of stations has not materially increased, and as in the case of the tramway undertakings, but little change has taken place in the existing installations—this being largely due to the influence of the metallic-filament lamp, which has unquestionably checked increase of output, and has in some cases caused an actual decrease. The constant growth of the power load, however, except in the purely residential districts, has gone far towards counteracting this effect, and in the majority of cases the output shows an advance. This, combined with a reduction in the peak load, means an improved load factor. We sincerely thank all the engineers and managers who have furnished data, and only regret that the necessity of publishing the table at this date prevents us from including the latest results of a number of works. But this would happen, no matter when we published it.

Comparisons of Costs.

When Mr. Pfeiffer read his paper on the Diesel engine, he paid a compliment to the author of a recent paper by using some of the figures it contained; his reward for doing so was that the author of the paper quoted declared that the figures in question were not truly representative of the facts, and, therefore, Mr. Pfeiffer had fallen into grave error by the use thereof. Now this is all very well as a means of attack, but, incidentally, does it not recoil upon the author of the paper quoted? The particular figures purported to be figures of sub-station costs, and were accepted in good faith; but now they are seen not to be representative figures, but merely figures for a more than ordinarily costly instance. We cannot see that Mr. Pfeiffer was to blame for quoting the figures; apparently, had it not been for his bringing them forward, we should never have learned that they were really of no value as a guide.

But is there not too much of this comparison of station costs? Every case is so distinct that there can be little value

Oerlikon Electro-Hydraulic Riveter.

An interesting application of electric power in combination with hydraulic mechanism is shown in the accompanying illustration of the portable riveter of the Maschinenfabrik Oerlikon (G. Wüthrich), Oswaldestre House, Norfolk Street, W.C. The hydraulic system, with its enormous force and uniform motion, is ideally adapted to riveting, while the electric cable is the ideal means of conveying power to the machine; the advantages of both systems are utilised by employing an electric motor to drive a pump carried on the riveter itself. The frame is a strong steel casting, with a gap 30 in. deep and 16 in. wide; the hydraulic cylinder forms part of one of the jaws. The motor is of 4 to 6 H.P., and runs at 1,420 R.P.M., driving through worm gear and connecting rods a reciprocating pump of the differential piston type, making 170 strokes of 1½ in. per minute. The cylinder is built for a maximum riveting pressure of 90,000 lb., and is capable of dealing with rivets up to ⅞ in. in diameter; the outward speed is 16·5 in. per minute, and the return stroke 70 in. per minute. A small reservoir is provided for the liquid (a mixture of glycerine and water with low freezing point), from which the pump draws its

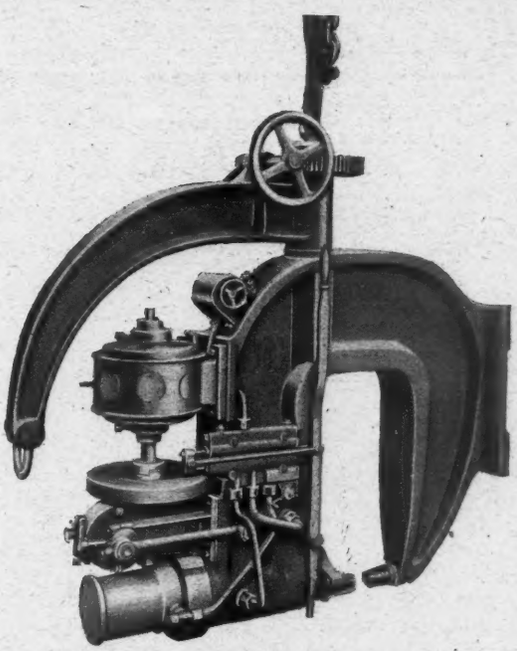

Fig. 5.—Electro-Hydraulic Riveter.

supply; when the controlling lever is in the central position the water is returned to the reservoir, but on moving the lever to the working position, the pressure rises steadily, and can be maintained on the rivet as long as desired, the excess of liquid when the rivet is closed being returned to the reservoir through an adjustable spring-controlled valve. A float fitted with packing rings rises and falls in the reservoir, and keeps the liquid constantly fed to the pump, in spite of the varying quantity in the reservoir, no matter to what angle the riveter is tilted. The machine weighs 2,750 lb., and with three men, during an ordinary 10-hour run, it has put in 1,000 ¾-in. rivets. It can be used anywhere, slung from a crane hook, and can, of course, be coupled up to the supply circuit at any point, while a mishap to one riveter will not affect others on the same circuit. The pressure and time of dwell on the rivet are adjustable to suit the size of the rivet, an advantage which, it is claimed, this riveter alone possesses.

A similar type of riveter is made for use as a stationary riveter in boiler works, &c., in very much larger sizes, in which a sheet closer is arranged concentrically with the snap.

OUR LEGAL QUERY COLUMN.

[Questions addressed to this column should be written on one side of the paper only.]

"Ampere" writes:—"We propose lighting a small town in Ireland, and would be glad to know whether a provisional order would be necessary, or, if not, what advantages would accrue to us in procuring one. We understand that it would enable us to keep out all possible competitors. The urban authority is favourable to the town being lighted, but is indisposed to go to any expense in connection with the scheme. Would it be necessary for an urban authority to obtain a provisional order before giving a firm permission to sell current and erect poles, &c., in the town? We would be much obliged for a reply to the foregoing queries, and would be glad to have the name of a good book dealing with the law on the subject."

*** There is no necessity to obtain a provisional order. Anyone can supply electricity without an order, provided he complies with (*a*) the requirements of the Board of Trade with regard to overhead wires, &c.; (*b*) the requirements of the local authority as to running wires under or over highways. One advantage of a provisional order is that it specifies a minimum charge for light which the holders may demand. A provisional order confers no monopoly; anyone else could set up a private supply in the area affected. The urban authority need not obtain an order before giving the necessary permission.

The subject is dealt with in "Emden's Building Contracts" (4th edition), p. 347 (Butterworth & Co., Bell Yard, London, E.C.).

L.G.B. INQUIRY AT WEST HAM.

As stated in our last issue, the Local Government Board inquiry, presided over by Mr. H. Ross Hooper, M.Inst.C.E., into the application by the Corporation of West Ham to borrow £74,600 for the purposes of the electricity supply undertaking, was resumed on Wednesday, the 16th inst. Mr. R. Elvy Robb again appeared for the India-Rubber, Gutta-Percha and Telegraph Works Co., who opposed the application, and Mr. Drucker, instructed by Mr. Tweedy Smith, for several local wiring contractors who felt that the wiring department of the undertaking unfairly interfered with their business. The Corporation were represented by Mr. Edward Morten, K.C., and the principal officials.

The Inspector, in opening the day's proceedings, pointed out that, in his opinion, the questions as to the financial results of the past working of the undertaking, asked on the previous day, were revelant to the inquiry, for the essence of the successful working of the undertaking was the financial result, and that was the only justification which could be given for the further large loan on capital account now required.

The statement as to the working results of the sales and wiring department, which had been promised on the previous day, was handed in, Mr. Patterson, the borough treasurer, distinctly stating that he had not had time to closely examine it, and would not, therefore, vouch for its accuracy. He, however, stated that in future these separate accounts would be kept and presented at the same time as the annual financial statement.

Mr. Drucker asked a number of questions both of Mr. Patterson and of Mr. Holmes, the manager of the sales department, as to the present system of working, but he failed to elicit any definite information as to what wiring work had been carried out. Mr. Holmes could not say how many installations had been carried out during the past year, or what rate of profit had been earned; he, however, said sufficient records had been kept to enable him to say that they did not work at a loss. They had carried out several installations outside the borough, but the practice had now been discontinued.

The sales department had been reorganised during 1907, and the system of assisted wiring at present in force, under which the consumer paid 25 per cent. before the work was commenced, and the balance in eight quarterly instalments, has proved a success. It was admitted by Mr. Patterson that the plan previously in existence some years, under which payments were spread over a period of ten years, had proved unprofitable and had for some time been discontinued.

Mr. Drucker then proceeded to inquire as to the methods used by the department to get business, and produced some cable quotations sent out by the department early in 1908, which, he said, were lower than prices quoted by manufacturers to the trade. In support of this statement he called Mr. Troup, of the firm of Messrs. Troup, Curtis & Co., who were wiring contractors in the borough.

Mr. Troup gave evidence as to the low prices offered by the department, and stated that he ordered 180 yards of 7/21½ cable at the quoted price. The cable supplied was said to be of Messrs. Siemens's make, and though an attempt was made to charge a higher price the claim was withdrawn, and the transaction was closed on the quoted terms. Pieces of this cable were sent to Messrs. Siemens, who repudiated manufacturing it. This was later substantiated by Mr. Huddleston, Messrs. Siemens's representative, who pointed out that the cable differed materially from British practice, and was, in his opinion, of Continental make. The fact that the price charged for the cable was lower than those charged by members of the Cable-Makers' Association to the trade was supported by Mr. Coxell, clerk to Messrs. Troup, Curtis & Co. The cross-examination of these witnesses by Mr. Morten was deferred till a later stage of the inquiry.

Mr. Elvy Robb opened the case on behalf of the India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd. He stated that his clients were large ratepayers, contributing not less than £7,000 per annum to the local rates, and as such were deeply interested in the prosperity of the undertaking. They were also as electrical engineers anxious that nothing should be done to discredit the industry. They had looked into the published accounts of the undertaking, and into the possibility of supplying energy on a profitable basis at the low rate of 0·37d. per unit, and their engineer, Mr. Stuart Russell, M.I.E.E., had come to the conclusion that this could not be done with fairness to other consumers. This opinion was upheld by Mr. W. H. Patchell, M.I.E.E., who would also give evidence on the question. As regards the recently-published accounts, he would point out that the undertaking was only rated at £250, whereas the new assessment was £12,900. If this were taken in the future, the rates, instead of being about £116, would at 9s. in the £, be over £5,600, a difference which would go far to swallow up any surplus calculated on the present basis.

He considered the selling price of ·37d. and even ·43d. per unit, which was stated to be the average price per unit for the 5½ million units sold in the Silvertown district was too low, and he would put in carefully-prepared figures calculated on the actual results of working at West Ham to prove this. These figures were prepared on the basis that each consumer ought to pay his share of capital charges on the basis of the ratio of his maximum demand to the maximum demand of the station provided there was no diversity factor.

Mr. Robb stated that proper depreciation charges should be allocated each year, as bearing in mind the practical abandonment of the Abbey Mills station, the reserve fund of £2,017, or about ½ per cent. of the total capital outlay, was quite inadequate.

After some discussion as to evidence as to cost of additions to electricity supply stations, given by Mr. Seabrook last year before the Parliamentary Committee on the London Power Bills, the inquiry was adjourned till Monday, July 5th, when the various estimates of cost will be fully examined.

FOREIGN AND COLONIAL TARIFFS ON ELECTRICAL GOODS.

DOMINICAN REPUBLIC.—Consular invoices are necessary for all goods shipped to the Dominican Republic. Invoices must be delivered in quadruplicate in the Spanish language to the Consul or his representative, and must contain the following particulars: The name of the shipper and owner of the merchandise; the name of the person or consignee; the place in which the goods are embarked, and the port to which they are consigned; the class, nationality and name of the vessel, and that of the captain; the marks, number and gross weight of each package; the net weight, measure and quality of the contents of each package, with an indication of the number of pieces of wrapper of each kind contained therein; the true value of the merchandise according to the quotation of the market at the time of presenting the invoices.

At the foot of the invoices the following declaration must be made and signed by the firm:—

Declaro que los bultos qui figuran en esta factura han sido comprados in Inglaterra para consumo en el Territorio de la Republica Dominica y que el contenido valor y pesos estan correctamente espresados.

Londres. 19.....

(*Translation*)

I declare that the merchandise referred to in this invoice has been bought in England for consumption in the Republic of Dominica, and that the value and weights have been correctly given.

London. 19.....

Dollar = 4s. 2d.

An *ad valorem* duty of 73·8 per cent. is levied on the following goods imported into San Domingo, the values on which duty is calculated being as shown below.

Steel in bars and ingots	$10 per 100 kg.
Turpentine	$ 80 per gallon.
Wire, if iron plain	$·10 per lb.
Wire, if copper or brass, yellow or white ...	$·30 per lb.
Tar	$3 per barrel.
Lamp shades, if glass, plain or otherwise ...	$2 per pair.
" if crystal, porcelain, or alabaster	$6 per pair.
Pitch	$4 per barrel.
Steam boilers	Free.
Bells of all classes and sizes	$50 per 100 kg.
Glassware not specified in the tariff	According to declaration.
Petroleum (kerosene)	$·15 per gallon.
Instruments not specified in the tariff	According to declaration.
Machinery not specified in the tariff	According to declaration.

In the case of certain goods, specific duties are payable as follows:—

Copper in bars or sheets	$5 per 100 kg.
Iron, unmanufactured, unwrought	$1 "

The following goods are free of duty:—Agricultural machinery and machinery for manufacturing industries, lubricating grease or tallow, machinery and instruments for scientific purposes, pumps, other articles for use of local manufacturing establishments.

Goods not separately mentioned would pay a duty of 73·8 per cent. *ad valorem*.

In addition to the Customs duties, there are certain internal taxes imposed upon imported merchandise by the general Government and by municipalities, with the approval of Congress.

Carbide of Calcium.—The over-production of carbide of calcium in Germany is compelling the works to restrict the output, and as a consequence the sales of electrodes are being unfavourably affected. The carbon factories which turn out electrodes for the carbide works are having to work on these articles for stock for the first time for several years past.

NEW PATENTS APPLIED FOR, 1909.

Compiled expressly for this journal by W. P. Thompson & Co., Electrical Patent Agents, 322, High Holborn, London, W.C., and at Liverpool and Bradford, to whom all inquiries should be addressed.

13,250. "Improvements in methods of charging and discharging secondary batteries or electric accumulators." A. M. Taylor. June 7th.

13,253. "Improved electrolytic meter." G. S. Cattell and G. Hookham. June 7th.

13,265. "Stage arc lamp." T. Francis. June 7th.

13,268. "Improvements in liquid resistances." A. Dittmar. June 7th.

13,295. "Improvements in or relating to electric furnaces." H. Nathusius and Westdeutsche Thomasphosphat G.m.b.H. (Application for Patent of Addition to No. 7,188/08.) June 7th. (Complete.)

13,332. "Improvements in and relating to automatic signalling and checking apparatus for railway signals." I. von Kovotkiewitsch. June 7th.

13,343. "Smoke-actuated and heat-actuated electric fire alarm." A. W. Turner. June 7th.

13,391. "Improvements in or connected with incandescent electric lamps of the Nernst type." A. Clarke. June 8th.

13,407. "Improvements in clutches for electric automobiles and the like." C. M. de Sainte-Claire. (Date applied for under Sec. 91 of the Act, November 16th, 1908, being date of application in France. Application for Patent of Addition to No. 13,234, 1909.) June 8th. (Complete.)

13,433. "Improvements in and relating to electric fuses." O. Engel. June 8th. (Complete.)

13,442. "Improvements in electric switches and switch fuses." H. H. Berry. June 8th.

13,443. "Improvements in protected or armour-clad electric switch fuses." H. H. Berry and W. J. Markham. June 8th.

13,473. "Improvements in mercury or metallic vapour lamps." H. A. Kent. June 9th.

13,509. "Improvements in spark coils." E. Wilson and W. H. Wilson. June 9th.

13,523. "Improvements in electric alarm clocks." W. Schroder. (Date applied for under Rule 13, February 3rd, 1909. An invention comprised in No. 2,596, 1909, dated February 3rd, 1909.) June 9th.

13,526. "Improvements in or relating to magnetos, more particularly intended for the purposes of ignition in internal combustion engines." F. L. Muirhead and A. H. Smith. June 9th.

13,527. "Improvements relating to electric incandescent lamps." H. S. Stoneham. June 9th.

13,528. "Improved method of resuscitating electric accumulator plates." J. M. Gorham, B. M. Drake and D.P. Battery Co., Ltd. June 9th.

13,532. "Improvements in electrical accumulators." G. Stoker. June 9th.

13,542. "Improved process and apparatus for electro-therapeutic treatment." N. Tscherkassoff. June 9th. (Complete.)

13,560. "Improvements in and relating to dynamo-electric machines." A. H. Midgley and C. A. Vandervell. June 9th.

13,573. "Improvements in and relating to the generation of currents." E. C. R. Marks. (J. L. Milton, United States.) June 9th. (Complete.)

13,590. "Improvements in or relating to electric starting and regulating switches." G. O. Donovan. June 10th.

13,612. "Improvements in the joining of metal to porcelain or other non-conducting materials as applicable to electrical and other work." R. W. Kemble. June 10th.

13,655. "Improvements in and relating to switchboards for electrical installations." British Thomson-Houston Co., Ltd., and G. Richardson. June 10th.

13,656. "Improved method of and means for operating electric switches for lighting railway trains." F. J. Beaumont. June 10th.

13,661. "Improvements in electric contacts." A. Schweiger. June 10th (Complete.)

13,701. "Improvements in methods of charging and discharging secondary batteries or electric accumulators." A. M. Taylor. June 11th.

13,728. "Improvements in electric arc lamps." F. W. E. Schuer. June 11th.

13,784. "Improvements relating to controlling mechanism for electric motors." W. E. Lake. (F. Bissel Co., United States.) (Date applied for under Rule 13, January 12th, 1909; an invention comprised in Application No. 758, 1909.) June 11th. (Complete.)

13,749. "Improvements in telephone exchanges." Siemens Bros. & Co., Ltd. (Siemens & Halske Akt.-Ges., Germany.) June 11th. (Complete.)

13,750. "Improvements in telephone exchanges." Siemens Bros. & Co., Ltd. (Siemens & Halske Akt.-Ges., Germany.) June 11th. (Complete.)

13,762. "Improvements relating to alternating electric current distribution systems." J. S. Peck. (Date applied for under Rule 13, July 15th, 1908. An invention comprised in Application No. 15,047, July 15th, 1908.) June 11th.

13,763. "Improvements relating to alternating electric current distribution systems." J. S. Peck. (Date applied for under Rule 13, July 15th, 1908. An invention comprised in Application No. 15,047, dated July 15th.) June 11th.

13,771. "Improvements in telephones." C. Adams-Randall. June 11th.

13,786. "Improved method and means for fixing electric conductor wires on insulators." C. Linke. June 11th. (Complete.)

13,823. "Electric railway signal." A. A. Norris. June 12th.

13,827. "Improvements in or relating to the transformation of electrical energy into heat energy." C. O. Bastian. June 12th.

13,831. "Improvements in electric relays for railway signalling and other apparatus." R. M. Abraham and British Pneumatic Railway Signal Co., Ltd. June 12th.

13,842. "Improvements in electric arc lamps." W. R. Ridings. June 12th.

13,851. "Improvements in electric signalling apparatus for use on and in connection with railway locomotive engines and the like." Improved Railway Signals, Ltd., and A. C. Bouneville. June 12th.

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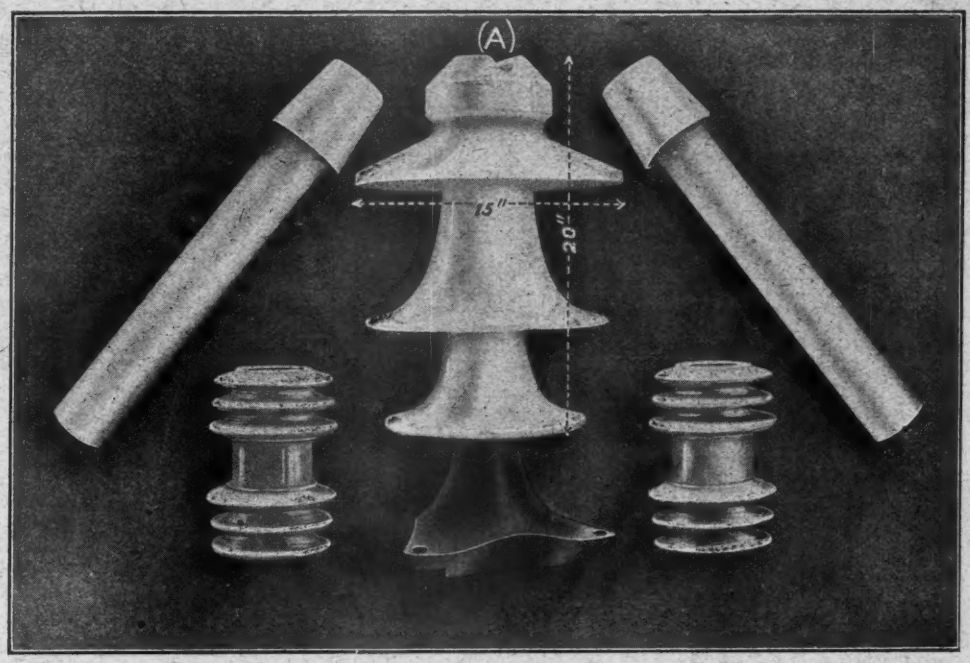

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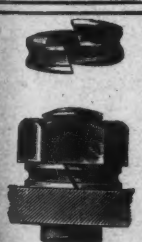

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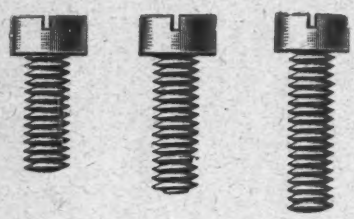

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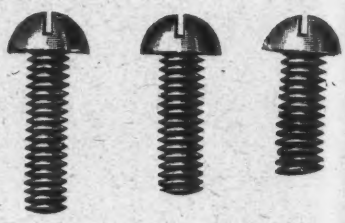

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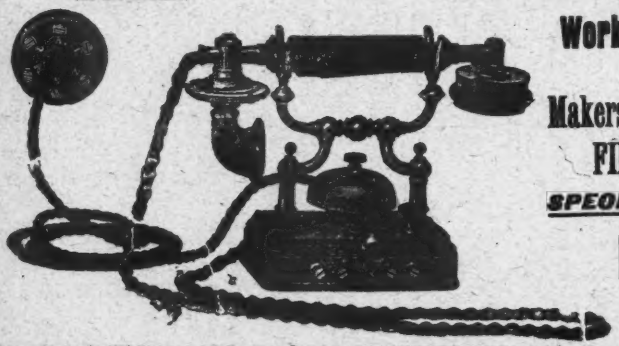

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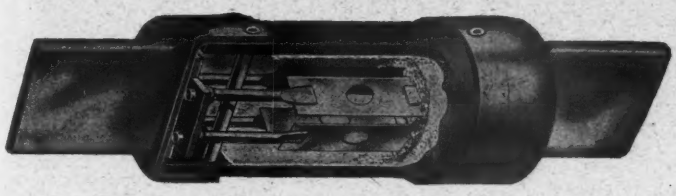

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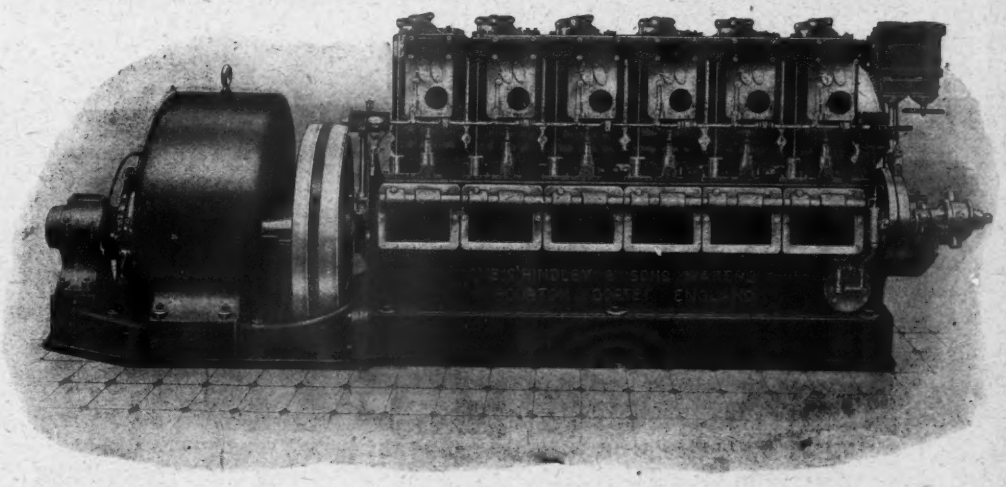

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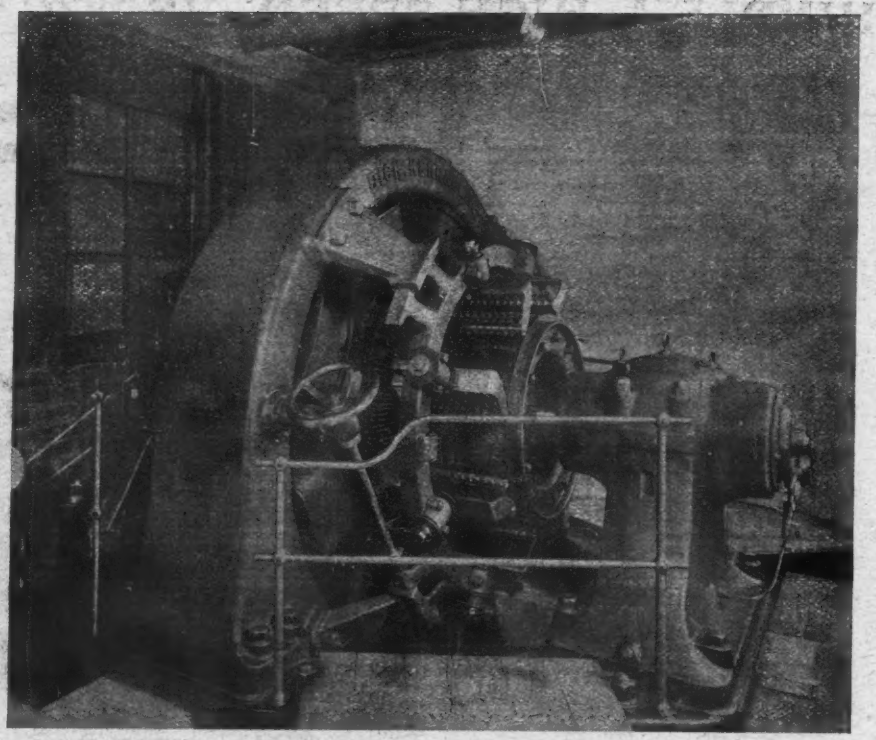

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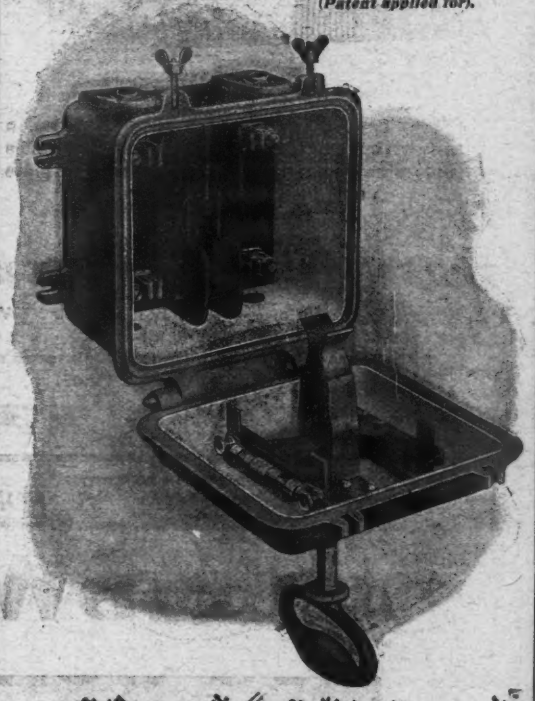

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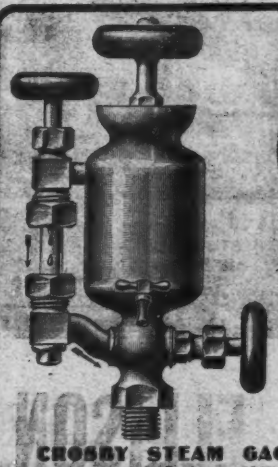

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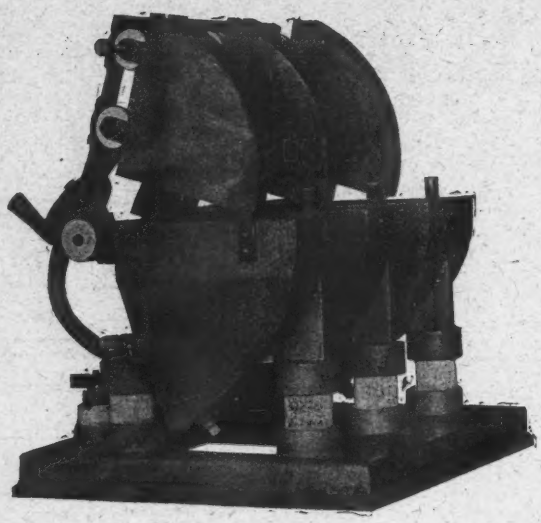

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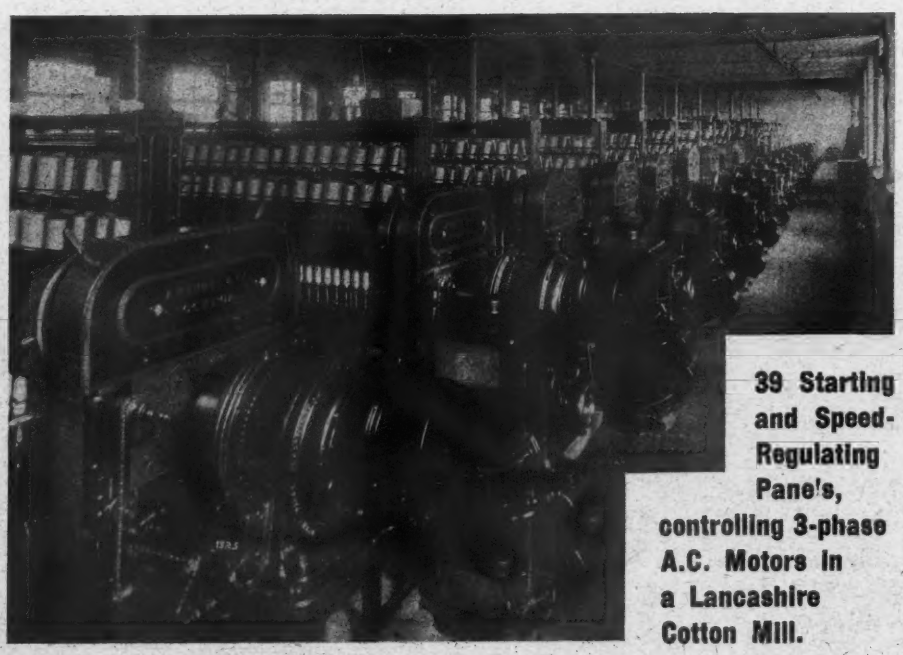

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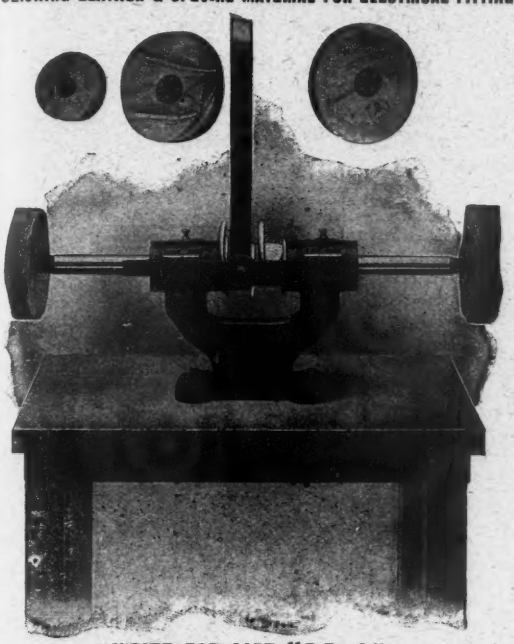

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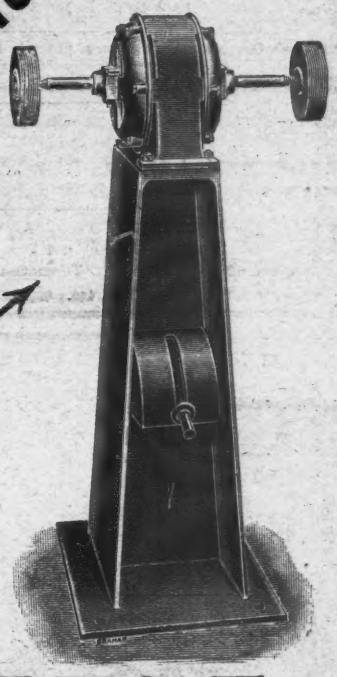

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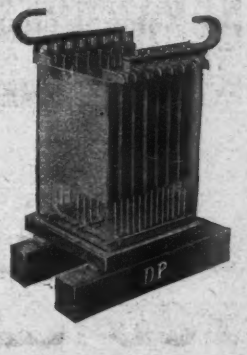

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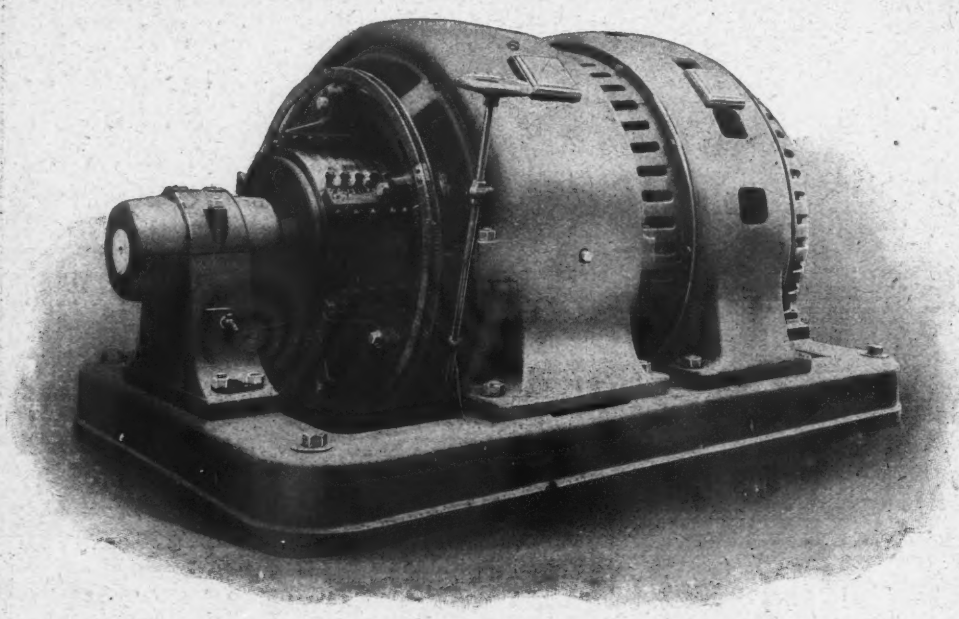

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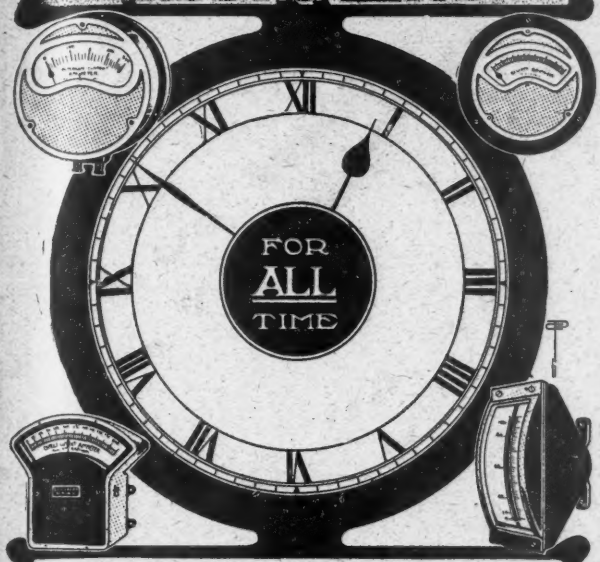

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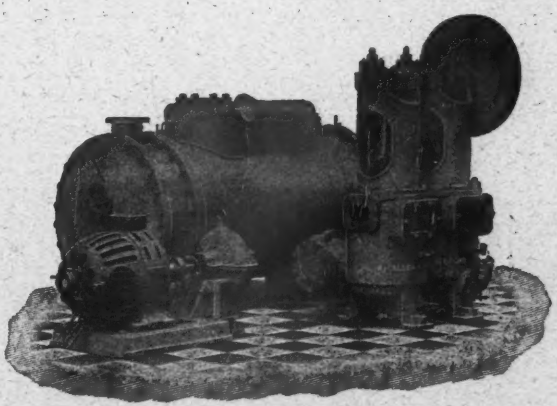

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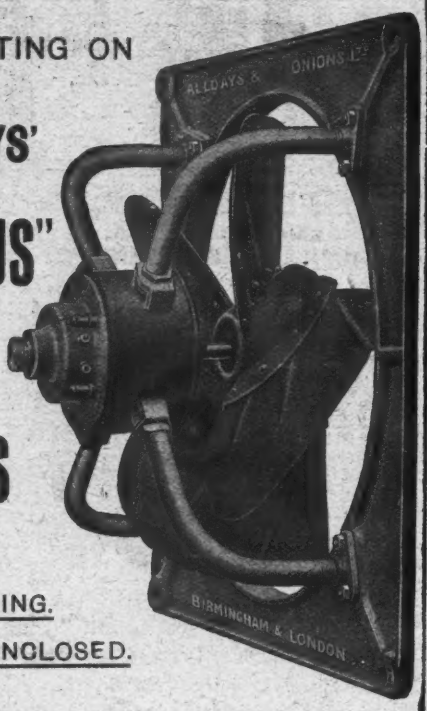

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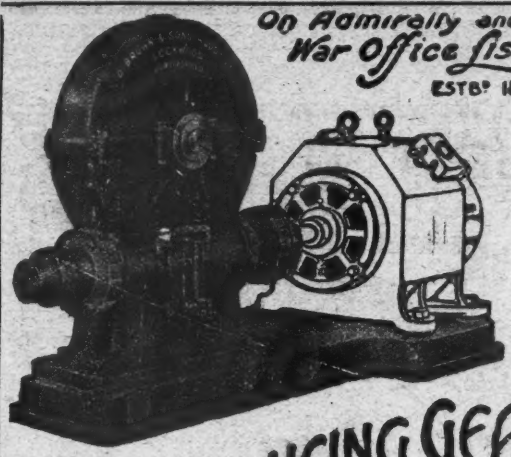

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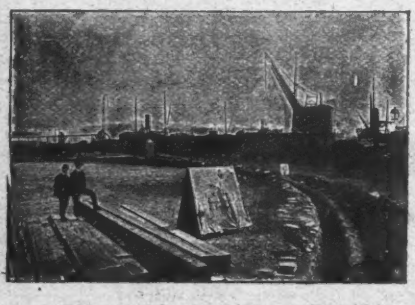

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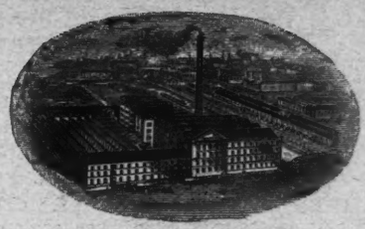

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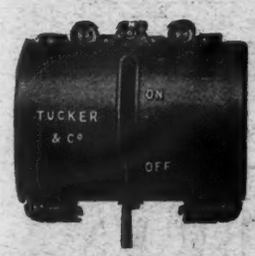

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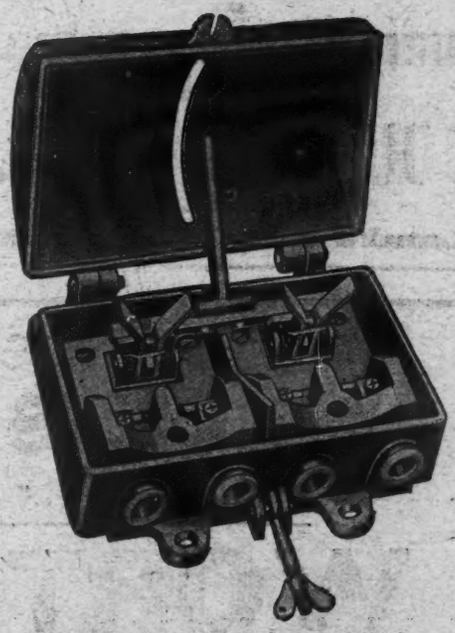

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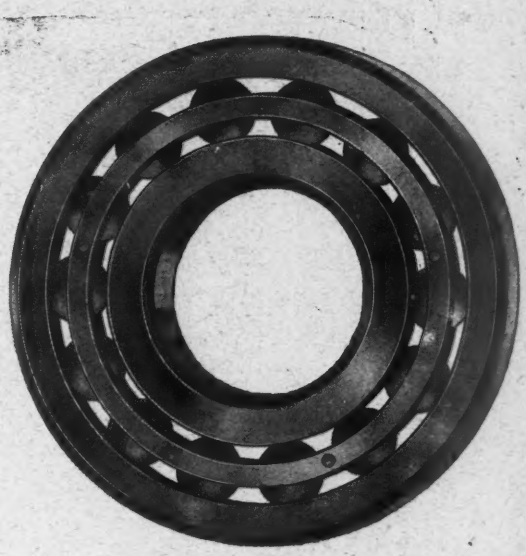

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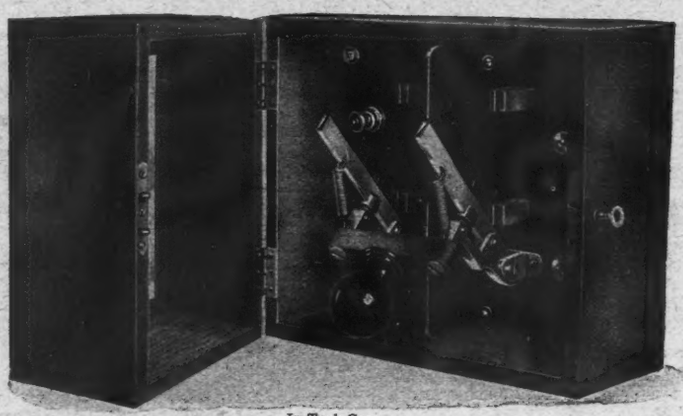

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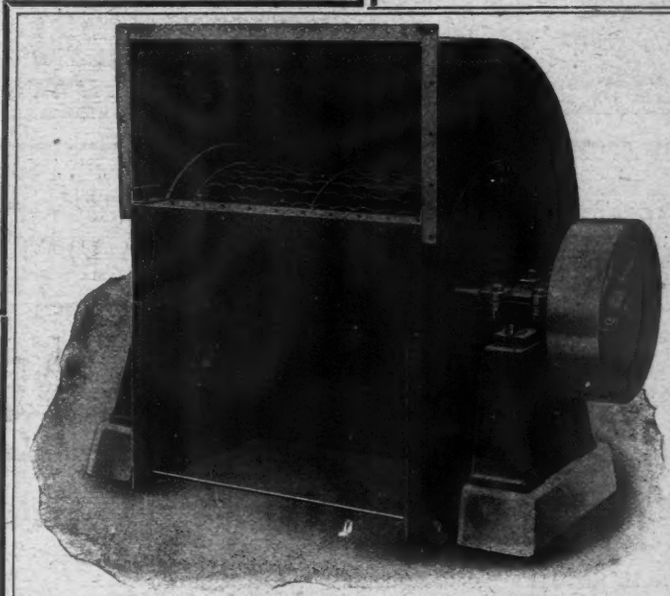

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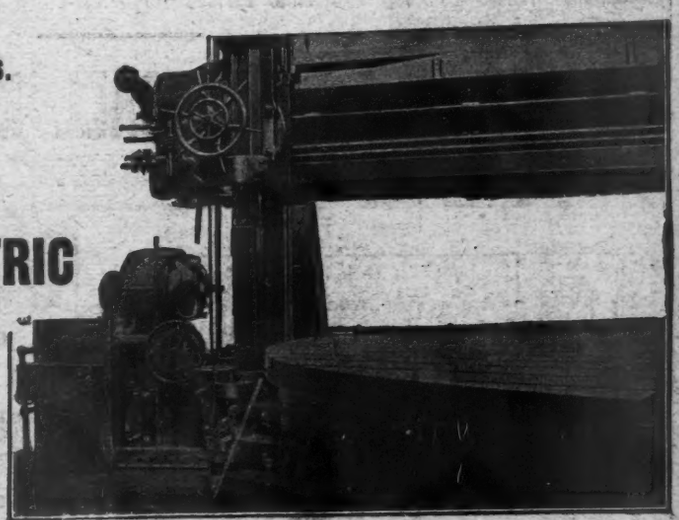

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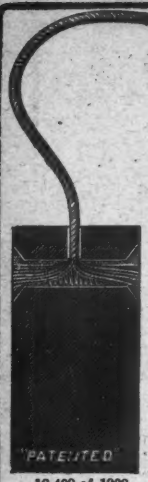

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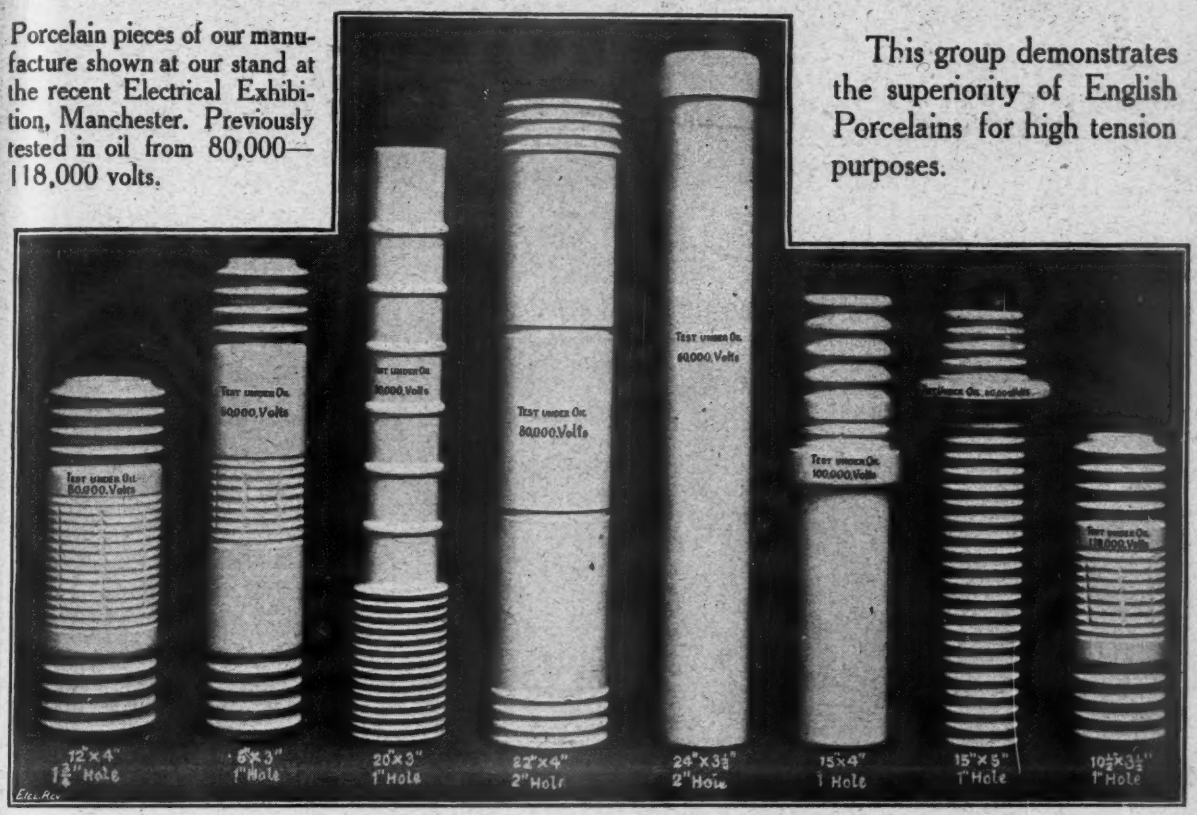

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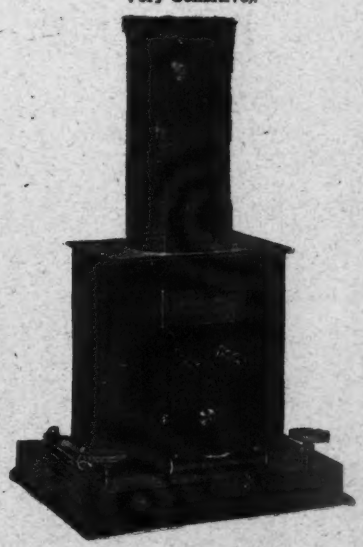

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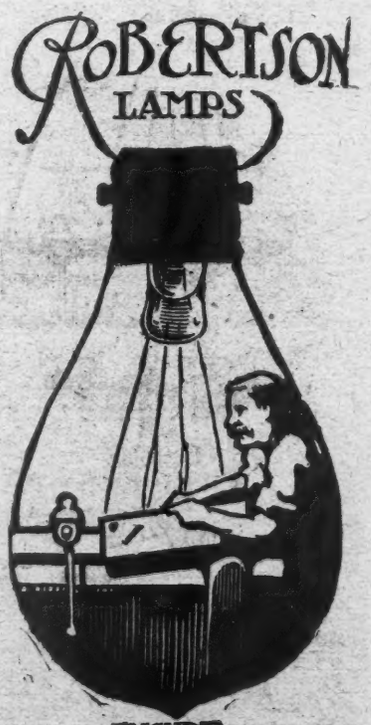

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INSTRUCTION required.—Construction and Wiring of Generators, Measuring Instruments, Telephone Systems. State terms and facilities.—4019, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

TRAMCAR Wiring Diagrams, Thomson-Houston, Westinghouse, Dick Kerr systems, 1s. each.—WOODS, 25, Spekeland Street, Liverpool. 3948

EDUCATIONAL NOTICES.—*Continued.*

WIRELESS Telegraphy.—No previous technical knowledge required. Practical and theoretical Instruction given. Complete tuition, from elementary to advanced. Lectures and practical demonstrations. N.B.—82 per cent. of our students obtained Government certificates at last official exam., followed by good appointments. Day and evening classes.—Full particulars gratis on application to RADIO DEPT., British School of Telegraphy, 179, Clapham Road, London, S.W. 3665

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A VACANCY occurs for a premium pupil in small central station. Particulars from ENGINEER, Electricity Works, Redditch. 3753

APPLICATIONS for Appointments arranged in best form, greatly appreciated by recipients. Numerous unsolicited testimonials.—Write now.—HERBERT GREATOREX, Birchover, Matlock. 3702

APPLICATIONS for Appointments cheaply and neatly prepared. Testimonials copied.—For particulars write PREMIER TYPEWRITING COMPANY, Spon Lane, West Bromwich. 3670

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BOROUGH Electrical Engineer has vacancy for Pupil or Improver. Premium and salary. State age.—3828, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

CONTROLLER Draughtsman wanted, only first-class men experienced in barrel and tramway type controllers need apply. Permanent job if satisfactory. Apply giving full particulars, age and salary required.—3758, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

DRAUGHTSMAN wanted for electrical installation department of shipbuilding yard, must have experience of latest Admiralty systems and preferably accustomed to supervise work on shipboard.—Apply, stating age, experience and salary expected, to 3958, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

FOR Editorial Work.—Wanted the temporary services of one or two Electrical Engineers conversant with one or more of the following branches: electric traction, lighting and wiring, station plant and layouts, telegraphy and telephony. Salary £4 per week. No application can be considered which does not prove previous literary as well as technical experience.—Apply Box M., c/o PAUL E. DERRICK ADVT. AGENCY, 34, Norfolk Street, Strand. 4065

(Continued on next page.)

SITUATIONS VACANT.—*Continued.*

GLASS Blowing.—Foreman, energetic, good organiser, fully capable taking charge lamp making department.—Apply with copy of references, stating previous experience and salary expected, 4003, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

JUNIOR Test Room Assistant required, with firm of electrical instrument makers.—State age, qualifications, and salary required, 4013, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

MAINS Foreman wanted, on small A.C. system near London, able to make wiped joints; familiar with meter fixing and actual operation of mains. Knowledge of arc lamps a recommendation. State age, experience, &c. Wages about 40s. per week.—4012, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

REPRESENTATIVE required for S. Wales district for sale of vulcanised India-rubber and bitumen cables. Only those capable of introducing large number of enquiries and orders need apply. Give full particulars of experience.—4002, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

REQUIRED, Draughtsman and Estimator, capable of making water-colour sketches, &c., of electric light fittings.—State age, experience and salary required, in strict confidence, to 4016, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

SHOWROOM Attendant wanted for electrical fittings; also smart Countermen for accessories and general supplies. Must be experienced men used to the trade. Application by letter, stating experience and salary required, to G., c/o. Siemens Brothers Dynamo Works, Ltd., Caxton House, Westminster. 4006

SIEMENS Brothers Dynamo Works, Ltd., have vacancy at their Newcastle branch for Traveller (salary, commission, and expenses). Only thoroughly experienced men, capable of producing good results need apply.—Give full particulars as to past and present occupation, turnover during last five years, salary expected, age, &c., by letter only, to 39, Collingwood Buildings. 3694

SMART Canvasser for Lamps. Commission only.—3974, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

TRAVELLER, having good connection amongst architects, consulting engineers, and others, required by London firm of contractors. Must be energetic and able to introduce new business.—Apply, stating age, experience, and salary required, 4028, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WANTED, Works Manager, thoroughly experienced in mechanical rubber trade. One with knowledge of cable making also preferred. Good terms to a good man. Applications treated in confidence.—Apply by letter to MANAGER, St. Helen's Cable and Rubber Co., Ltd., Warrington. 3688

WANTED, for the Provinces, Clerk-Storekeeper, wholesale electrical stores, able keep books. Shorthand a recommendation.—Apply in own handwriting, stating full experience, copies of references, and lowest wages, to 4030, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WANTED, Motor Inspector to undertake duties of Instructor to Motormen. Applicants with knowledge of Westinghouse equipments and brakes preferred. Wages 36s. per week.—Apply by letter only, to GENERAL MANAGER, Bournemouth Corporation Tramways. 4014

WANTED, an Electrical Engineer for a leading electrical firm in India: must be fully acquainted with the manufacture and working of Messrs. Ernest Scott & Mountain's colliery electric plant. Age not to exceed 27 years, unmarried. Five years' agreement: commencing salary equivalent £25 monthly.—Apply, with testimonials and stating references, to 4000, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WANTED, for Midlands, Switchboard Designer, well experienced in estimating for H.T. and L.T. switchboards.—Apply to 3993, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WANTED, Competent Representative, well up in accessories and switch gear, and with good connection in the Liverpool district.—State age, experience and salary, 4048, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

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APPOINTMENTS FILLED.

NO. 2947.—Applicants are thanked; position is now filled. 3980

NO. 3647.—Advertiser begs to thank all applicants, and to inform them that the vacancy has been filled. 4001

SITUATIONS WANTED.

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A COMPETENT Electrician wants job, wiring, bells, &c. Good references. Any distance. — Apply REDIT, Badewell Ash, Bury, Suffolk. 3831

A COMPETENT Electrician desires charge of plant, motors, dynamos, three-phase, switchboard erecting, telephones.—A., 12, Winkfield Road, Wood Green. 4039

A COMPETENT Electrician (30) requires charge of country-house plant; well recommended.—4035, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

A GOOD Working Foreman Electrician, expert, all conduits, casing, town and country mansions, wiring, testimonials.—3729, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

A GOOD Bricklayer (Furnace Builder), B. & W., quick and reliable, new or repairing; several years with C.L.E.L.C., also St.M.B.C., Islington B.C.; good references; temporary or permanent; distance no object.—4031, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ACTIVE, practical, energetic, electrical engineer (28), having workshop, installations, station, and commercial experience, desires position of responsibility, home or abroad.—E. TRENTHAM, Colwyn Bay. 3827

ADVERTISER (26), well educated, desires berth with firm of Electrical Contractors. Thoroughly experienced light and power, and general engineering.—3715, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ADVERTISER, M.I.E.E., fully experienced, with good connection and highest references, is open to negotiate with responsible electrical and mechanical engineering firms, to act as Representative, London preferred.—3691, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ADVERTISER (19) requires an opening in drawing office, no premium; four years' workshop experience, also technical training.—3740, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ADVERTISER (33), with extensive practical experience of installations, light, power, telephones, &c., private plants, central stations, steam, gas and oil, good draughtsman, used to estimating and supervising.—4046, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ADVERTISER of good education and address, 12 years' experience as manager of electrical contracting business, desires appointment.—4059, ELECTRICAL REVIEW, 4, Ludgate Hill, London

ADVERTISER requires re-engagement as Traveller to firm of electrical contractors (connection). Highest references.—4061, ELECTRICAL REVIEW 4, Ludgate Hill, London

ADVERTISER (31), three years' experience, traction, lighting, seven years' electricity meters, desires change, salary moderate.—4038, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ADVERTISER, with exceptional experience, desires engagement, responsible position, General Manager or Representative. Expert interviewer. Can sell or control.—3992, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ADVERTISER, 17 years A.C. and D.C. plant, overhead and underground mains, commercial experience, seven years' knowledge of Far East, open for engagement, home or abroad, as Engineer or Commercial Representative, permanent or temporary; excellent references.—3977, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ADVERTISER (age 26), at present attending Battersea Polytechnic, would be glad to obtain progressive position with a first-class London firm of Electrical Instrument makers. Would give services for one year. Good knowledge of French and German.—4026, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ALL-ROUND Wireman and Plant Hand wants Work, anywhere.—CLAYTON, 12, Byrne Road, Balham. 4022

AN Electrical Engineer, now in Far East installing and operating D.C. plant, generating and demanding 2250 KW., desires re-engagement on termination of agreement. Home or abroad. Unique experience on heavy power plants, gas and steam. 3717, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

AN Electrotechnical Graduate (der auch Deutsch spricht), with manufacturing, testing, literary, and thorough commercial experience, desires position with leading manufacturers or consultants.—3754, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ARMATURE Winder, fitter, traction, power, light, install, maintenance.—30, Jamaica Road, Bermondsey, S.E. 4042

(Continued on next page.)

SITUATIONS WANTED.—*Continued.*

AS Assistant Manager or Foreman (27), well educated, hard worker, experienced in contracting (all branches) and charge of plant generally.—4054, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

AS Manager or Assistant Manager.—Gentleman, many years with leading London wholesale house, desires change. Well known throughout the trade, and can influence really important business in lighting, power, telephone and bell material. Capable organiser, original in ideas, and in close touch with home and Continental markets. Could invest capital. Salary £300 per annum.—3982, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

AS Resident Engineer or Station Superintendent.—Advertiser (33) seeks above position, A.M.I.E.E., A.M.I.Mech.E., 13 years' experience in direct-current and polyphase, for lighting, power and traction. Smoke prevention, low generating costs, maintenance of plant and H. and L. tension mains; excellent testimonials.—4017, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

CARPENTER and Joiner seeks job, constant work, in an electrical or engineering works. Good mechanic; references; do anything; abstainer. Age 47.—P., 66, Barnwell Road, Effra Road, Brixton, S.W. 3780

DRAUGHTSMAN desires engagement, moderate salary.—4043 ELECTRICAL REVIEW, 4, Ludgate Hill, London.

DRAUGHTSMAN, two years college, five years shops, seven years drawing office, desires change; Admiralty D.C. motors specialty.—3986, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ELECTRICAL Engineer (University), employed last five years with first-class German company, experienced in plant design, erection, high tension A.C. (age 28), wishes responsible position as Assistant Superintendent with important electric corporation or consulting engineer. Italian, knows English, French, German. Best references. Will be in London in July.—Address Casella Postale 157, Milan, Italy. 3673

ELECTRICAL Wireman seeks permanent engagement in any capacity, 20 years' experience installing and maintaining large lighting and power installations; has carried out big jobs in Germany. Well educated, good technical knowledge. Speaks and writes German fluently, and knows French.—3719, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ELECTRICAL Engineer (28), diploma, desires to change berth. English and Continental experience, estimating and designing of electric plants, lighting, power, traction. Commercial experience. Able to supervise installation work. English, French, German.—3707, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ELECTRICAL and Mechanical Engineer desires position. Large experience with B.O.T. power, tramway and railway work. Technical, practical and commercial.—3971, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ELECTRICAL and Mechanical Engineer (27), good technical, mechanical and electrical training, also five years' commercial experience in alternating (one and three-phase high and extra high tension) and direct current supply for lighting, power and traction purposes, requires post as Chief Assistant or Charge Engineer.—3968, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ELECTRICAL Fitter used to all classes of electrical work; 6 years with manufacturing firm, good references.—JELF, 198, High Street, Lewisham, S.E. 3949

ELECTRICAL Engineer.—Gentleman (27), good education and address. Late expert to City firm, desires position with firm in London. Advertiser has had central station and business experience, and is a scientist. In addition to the knowledge of erecting and handling modern machinery, can prepare estimates, chemical analysis reports, &c. A moderate salary is required, and no commission business or investments will be entertained.—4055, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ELECTRICAL Engineer (24), four years' training at a London Institute (certificated), requires a situation.—W. F. B., 9, Alma Terrace, Kensington, London, W. 4051

ELECTRICIAN, lighting, bells, telephones and power; reliable worker.—COLE, 77, Park Lane, Croydon. 3771

ELECTRICIAN seeks charge of private or factory plant, anywhere, 12 years' experience, light, power, telephones, accumulators, engines, &c. All repairs. Technical and shop training.—3751, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ELECTRICIAN seeks situation as wireman with contracting firm, preferably in or near Birmingham. Five years' electrical experience with large firm.—3748, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ELECTRICIAN (22), competent, experienced in erecting plants, wiring, all branches and telephones.—3342, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ELECTRICIAN wants situation, 3 years' apprenticeship just completed.—121, Oxford Road, Reading. 4056

ELECTRICIAN or Engineer, stations, plants, works, wiring, &c., experiences.—H., 6, Daubney Road, Homerton. 4053

ELECTRICIAN (Wireman) seeks sit.; 15 years' experience, all branches; charge hand preferred.—F. H., 141, Annandale Road, S.E. 4034

SITUATIONS WANTED.—*Continued.*

ELECTRICIAN wants work. Used to telephones, lighting and motors; any distance.—5, Bretts Road, Hackney. 4027

ENGINEER, Mechanical and Electrical (28½), sound technical training, and five years' practical experience, including gas engine manufacture, London Power undertaking, mains, tramway work, turbo-alternators, and commercial office, desires appointment, either engineers' office or mains.—Address, 3988, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ENGINEER (28), experienced in central station design and layout; charge of generating plant, steam and oil, desires change.—3767, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ENGINEER, fully qualified, desires position as Assistant works manager or Clerk of Works, well up in tramway work.—3969, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ENGINEER, three years technical, three years practical, five years testing and inspecting material and electrical gear for power and traction work, desires position as Inspector, or with manufacturing or consulting engineers.—3970, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

EXPORT Electrical Trade.—Representative, having extensive connection among shippers of electrical plants and accessories, wishes to hear from firms desiring to find fresh outlets for their manufactures.—3821, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

FIRST-CLASS Armature Winder seeks employment; any type.—4036, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

GENTLEMAN (33), Secretary and Assistant Manager, seeks responsible berth with good firm, workshop, factory, chemical laboratory, and general office experience, excellent testimonials for management.—3826, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

GENTLEMAN, at present representing Firm in India, will be disengaged end of year, and desires re-engagement with first-class Firm of Electrical Manufacturers as Indian Manager or as Export Manager at home.—3983, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

IMPROVER (21), practical and technical training.—C. W., 145, Oxford Street, E. 3704

IMPROVER seeks re-engagement; four years' references, had all round experience.—3, Noel Street, City Road, N. 3967

IMPROVER seeks situation. Four years' experience with first-class firms; technical training; plant erecting; motors, dynamos, lighting, telephones, &c.—JAMES, 41, Charles Street, Stepney. 3984

SHIFT Engineer, with theoretical and practical experience, seeks a Situation; good testimonials. Could apply personally.—3664, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

TELEPHONE Engineer desires position abroad; experienced switchboard construction.—3822, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

TWO Wiremen, light, bell, Telephones, day or piece.—ELECTRICIAN, 26, Eleanor Road, Hackney. 3713

WANTED, the management of the Repairing Shops of a Motor Company or electric work, by a mechanical engineer (English), served his time in large engineering works in the North of England. Has since held a situation in charge of the erection of electric plant. Understands motor working, and is a good driver. Age 24. Speaks and writes French, Spanish and German, having learnt it in the countries.—Apply Box 4477, c/o Willing's Advertising Office, Moorgate Arcade, London, E.C. 3755

WIREMAN (26), thorough competent hand, disengaged; plant.—W., 4, Tottenham Square, Kingsland. 3963

WIREMAN, smart, light and motors, any distance.—WHEITON, Erkenwald Road, Barking. 3705

WIREMAN, first-class; town or country.—P., 9, Lyme Street, Camden Town. 3750

WIREMAN disengaged. Life abstainer; excellent references.—JAMES, 3, Derby Street, King's Cross, W.C. 3726

WIREMAN disengaged, 12 years' experience.—G. L., 14, Sterndale Road, West Kensington. 4025

WIREMAN (27), disengaged, lighting, motors, bells, telephones; 8d.; town or country; excellent references.—"ELECTRIC," 3, Great New Street, E.C. 4018

WIREMAN, competent, seeks Situation, all branches.—S., 40, Chipstead Street, Fulham. 4044

WIREMAN, thoroughly efficient, good all-round man; highest references.—FRANCIS, 70, Warren Road, Leyton. 4060

WIREMAN (experienced), all systems, seeks Job.—J. L., 3, Gossage Road, Plumstead, S.E. 4033

WIREMAN seeks Engagement, town or country.—H. D., 84, Pelham Road, Wood Green, N. 4052

WIREMAN-Fitter (25), experienced all branches, lifts, plants, power, lighting; good references.—COVINGTON, 13, Gordon Road, Stoke Newington. 4023

(*Continued on next page.*)

SITUATIONS WANTED.—*Continued.*

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YOUNG Man seeks Situation to look after electric plant and drive car; good references and certificate for driving.—GEORGE NEWBURY, 129, Hillingdon Street, Walworth. 3838

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WANTED, Working Partner in a pleasant country town; all-round man preferred; capital required, £160.—Apply 3985, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

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Power Station Plant for Sale.

THE TRAMWAYS COMMITTEE are prepared to receive offers for the following Plant (all in good working order) which is being replaced by larger units at the Tramways Power Station, Kelham Island, Sheffield:—

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18th June, 1909. 3999

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L.P. " " 40" "
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(Continued on next page.)

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OSRAMS, 19 220-volt 200 C.P. Lamps, only burnt 180 hours, list price 15s., sell 6s. each.—4063, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

FOR SALE.—*Continued.*

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TESTING Set, Silvertown pattern, to 15 megohms, and from 1/100 to 11,000 ohms, as new. Cost £15, lowest price £8 10s. Approval against deposit if required.—SCOTT, 141, Sebert Road, Forest Gate. 3749

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40 B.H.P. Open Type Shunt Wound Dynamo, 540 volts, 57 amps., 540 revs., slide rails and driving pulley, by W. T. Goolden & Co.—Apply R. H. PATTERSON & Co., Newcastle-on-Tyne. 3774

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(*Continued on next page.*)

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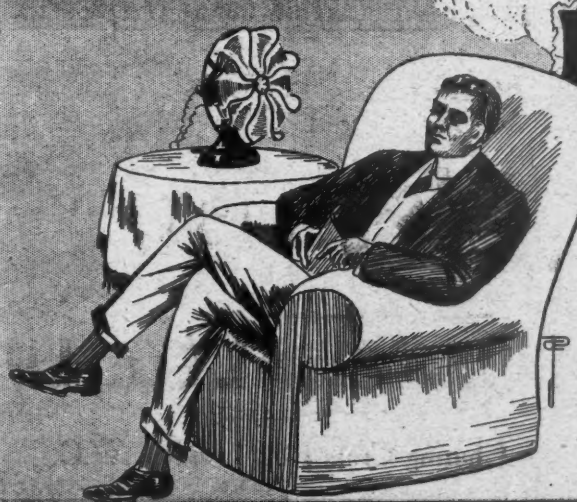

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There are two reasons why "Fortiter" Fans are selling so easily this season. Firstly, because if is now generally recognised that they are the best value on the market, and secondly, because we support the efforts of all contractors to sell them by furnishing them with a supply of artistic little booklets full of convincing selling argument.

Write to-day for List 3000, and Sample Booklet "Keep Cool."

Union Electric Co. Ltd.

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Glasgow, Newcastle-on-Tyne, Liverpool, Manchester, Leeds, Cardiff, Dublin, Reading and Gloucester.

REES "RoTURBo" PUMPS

TRADE MARK.

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REES ROTURBO M'F'G Co. Ltd.

INCORPORATING THE WORKS AND BUSINESS OF THOMAS PARKER, LTD.,

Electrical, Hydraulic & General Engineers

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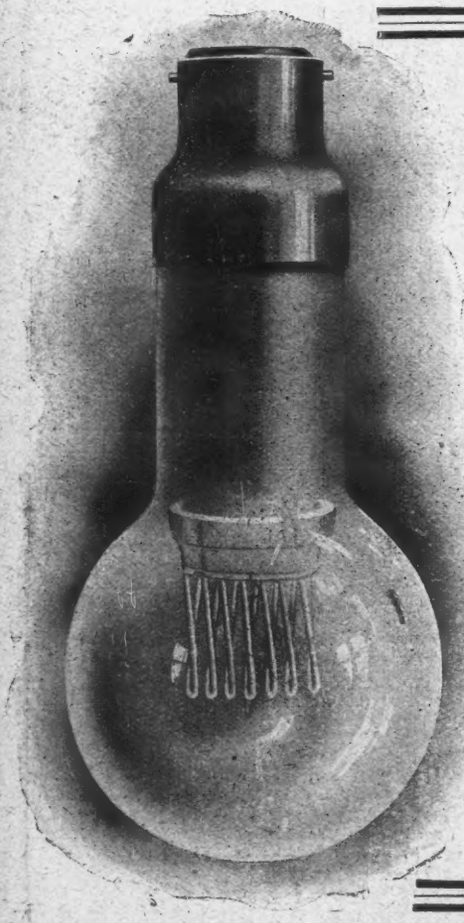

NEW HIGH EFFICIENCY LAMP

Can now be supplied for ALTERNATING CURRENT CIRCUITS.

30 c.p. 44 Watts.
A.C. and D.C.

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RELIABLE LAMPHOLDERS.

Specify "NEW MODEL."

"NEW-MODEL" LAMPHOLDERS BESIDES BEING **PERFECTLY STANDARDIZED,** BEAUTIFULLY MADE AND FINISHED, HAVE AN ADVANTAGE OVER ALL OTHER LAMPHOLDERS IN HAVING **NO LIVE METAL AT THE BACK OF THE CHINA.** OUR ARRANGEMENT FOR SECURING THE TERMINALS TO THE CHINA NECESSITATES ONLY TWO HOLES IN THE LATTER, AND ENABLES THE PROVISION OF **LARGE LOOP-IN TERMINALS.**

THEY COST NO MORE THAN COMMON HOLDERS,

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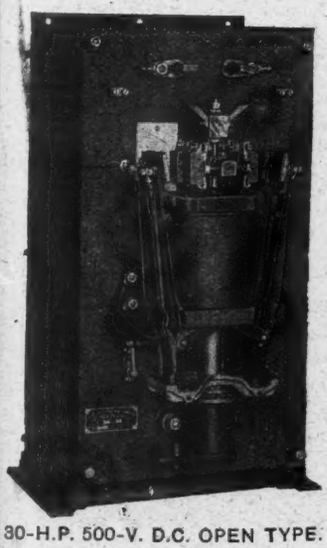
For MOTOR-DRIVEN MACHINE TOOLS, AIR COMPRESSORS, PUMPS, HYDRAULIC ACCUMULATORS, LIFTS, &c.



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NO SLIDING CONTACTS.

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Have only **ONE** Solenoid.

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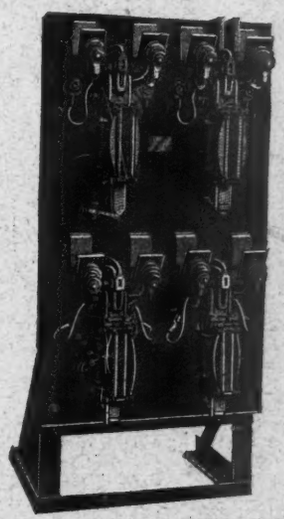
Are absolutely **SILENT.**

We quote on all Schemes for Starting, Stopping and Controlling Electric Motors Automatically or by Remote Control.



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Any manufacturer or other user of steam power can do this by installing the Underfeed Co.'s System of Mechanical Stoking. The Underfeed Stoker enables cheap, low-grade, slack coals to be burned with high efficiency; increases the thermal capacity of the boiler, and consequently the productive capacity of the plant, maintains a uniform heat, which obviates boiler strains; and positively prevents smoke, giving immunity from prosecution for smoke nuisance. High and consequently expensive chimneys unnecessary.

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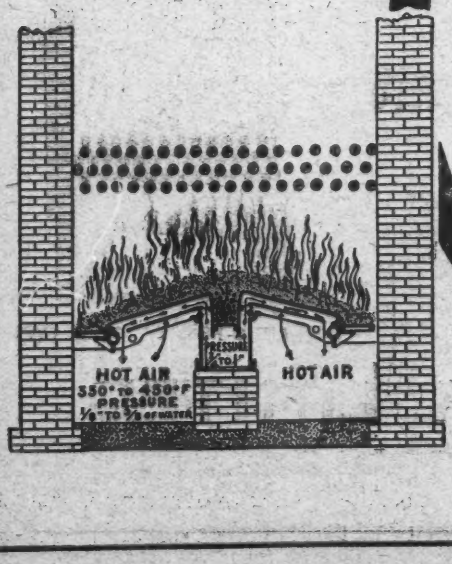

is one of the most successful inventions of recent years. Its powers are such, and they have been so conclusively proved, that we are prepared to guarantee it and actually effect our stated economy on **your** own premises, before any payment need be made.

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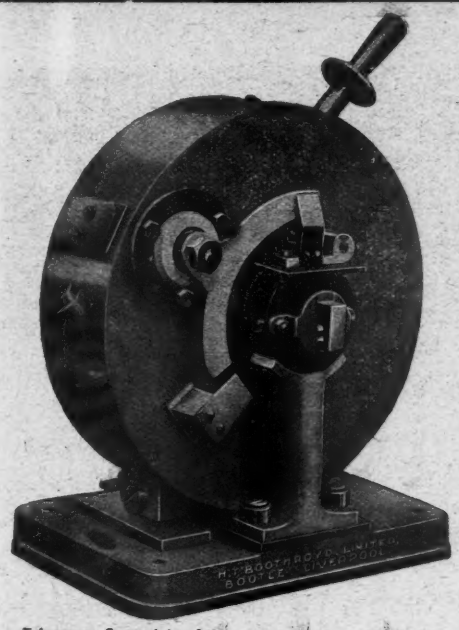
E.C.



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FITTED WITH

NO VOLT and OVERLOAD RELEASE

FOR

ALTERNATING CURRENT,
DIRECT CURRENT,
REVERSING CONTROLLERS,
HAULAGE, LIFTS,
CRANES, PUMPS,
COMPRESSORS,
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The Demand has **GREATLY REDUCED PRICES.**

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Telegrams: Commutator, Liverpool. Telephone 420 Bootle.

NOTICES RELATING TO PATENTS.

Latest time for receiving, 9 30 a.m. Tuesday

THE PROPRIETOR of Letters Patent No. 12,210 of 1901, relating to "Electrostatic Separators," desires to dispose of the Patent, or to grant Licences to interested parties on reasonable terms, with a view to the adequate working of the patent in this country.

Enquiries to be addressed to CRUIKSHANK & FAIRWEATHER, LTD, International Patent Agency, 65-66, Chancery Lane, London, W.C. 3794

TELEPHONES.—The Owners of British Patent No. 14,851 of 1906 for "Improved Apparatus for the Automatic Distribution of the Operating Service in Telephone Exchanges," desire to sell their patent rights or to grant Licences thereunder on reasonable and moderate terms.—For full particulars apply to DAY, DAVIES & HUNT, Chartered Patent Agents, 321, High Holborn, London. 3989

OFFICIAL NOTICES.

Latest time for receiving, 9.30 a.m. Thursday.

COUNTY BOROUGH OF SWANSEA.

Electricity Department.

THE CORPORATION OF SWANSEA invite Tenders for—

Contract 30.—For the Supply, Delivery, Adjusting and Testing of Continuous and Alternating Current Enclosed Type Arc Lamps, Resistances, Choking Coils, &c.

Contract 31.—For the Supply and Delivery of Plain Lead Sheathed, Two-core Conductor, Fibre-insulated 660-volt Cable, suitable for a draw-in system; also Rubber Insulated and Braided Single Conductor Arc Lamp Cable for a working pressure of 550 volts.

Contract 32.—For the Supply, Delivery, Adjusting and Testing of Arc Lamp Raising and Lowering Gear, Winches, Wire Rope, Arc Lamp Pillars and Brackets, together with all required Clamps, Straps, Bolts and Nuts, &c.

Contract 33.—For the Supply and Delivery of Arc Lamp Feeder Pillars, complete with Switch and Fuse Gear, Time Switches, Bus-bars, Sweating Sockets, Connections and Accessories; also Cable Joint Boxes, complete with Fittings, Glands, Bonds, Compound, &c.

Copies of the General Conditions, Specifications and Forms of Tender, can be obtained from Mr. C. A. L. PEUSMANN, M.I.E.E., A.M.I.M.E., Borough Electrical Engineer, Swansea (for Contracts 30 and 31 on and after June 28th, 1909; Contracts 32 and 33 on and after July 2nd, 1909) on payment of One Guinea for each of the Specifications, &c., which amount will be returned on receipt of a *bona fide* Tender. Additional copies can be obtained on payment of 10s. per copy, which amount will not be returned.

Contractors may tender for all or any of the Contracts.

Sealed Tenders, endorsed "Contract No. —," to be delivered at my Offices not later than (Contracts 30 and 31) noon, 7th JULY, 1909 (Contracts 32 and 33) noon, 14th JULY, 1909.

The lowest or any tender will not necessarily be accepted.

JNO. THOMAS,
Town Clerk.

Guildhall, Swansea. 3996

OFFICIAL NOTICES.—*Continued.*

WALLASEY URBAN DISTRICT COUNCIL.

ELECTRICITY DEPARTMENT.

To Electrical Engineers and Others.

THE WALLASEY URBAN DISTRICT COUNCIL are prepared to receive Tenders for the supply, delivery, and fixing of a Battery or Accumulators, Reversible Booster and Switchboard.

Copies of the Specification may be obtained on payment of One Guinea, which will be returned on receipt of a *bona fide* Tender, from Mr. J. A. CROWTHER, at his office, Sea View Road, Liscard.

Tenders will be considered from makers only, and all material shall be as far as possible British manufacture.

Sealed Tenders on the form provided for the purpose, addressed to the undersigned and endorsed "Tender for Battery," to be delivered at my office, as below, on or before MONDAY, the 12th JULY.

The Council do not bind themselves to accept the lowest or any Tender.

By order,
H. W. COOK,
Clerk and Solicitor to the Council,

Public Offices, Egremont,
Cheshire,
June 21st, 1909. 3995

CITY OF MELBOURNE, AUSTRALIA.

Tenders for Flame Arc Lamps.

TENDERS are invited for the Supply of 80 Alternating Current Flame Arc Lamps.

Specification, Tender Form, Conditions of Tendering, &c., can be obtained on application to the undersigned.

Tenders to be endorsed "Tender for Alternating Current Flame Arc Lamps," and addressed to the undersigned, and must be received by them not later than noon of WEDNESDAY, 7th JULY, 1909.

The Council do not bind themselves to accept the lowest or any tender.

McILWRAITH, McEACHARN & CO. PPTY. LTD.,
Billiter Square Buildings,
London, E.C.,
Agents for the Melbourne City Council. 4057

CITY OF MELBOURNE, AUSTRALIA.

Tenders for the Supply of 18 Transformers.

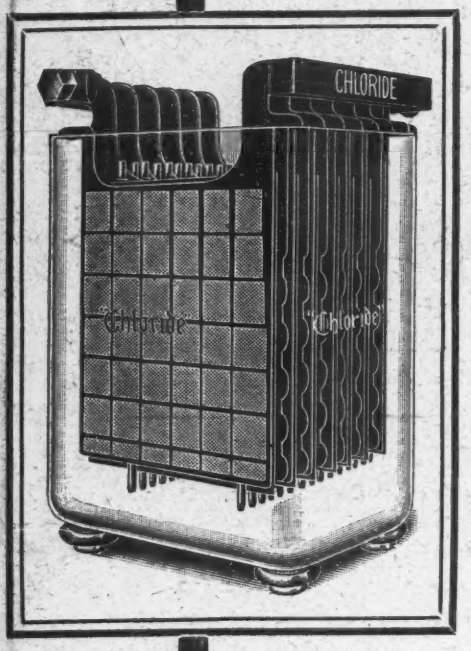
TENDERS are invited for the supply of 18 Transformers. Tender Form, Conditions of Tendering, &c., can be obtained on application to the undersigned.

Tenders to be endorsed "Tender for Transformers," and lodged with the undersigned not later than WEDNESDAY, JULY 7th, 1909.

The Council do not bind themselves to accept the lowest or any Tender.

McILWRAITH, McEACHARN & CO. PPTY. LTD.,
Billiter Square Buildings, E.C.,
Agents for the Melbourne City Council. 3812

Continued on page 89.



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When Comparing the Price of

The

"Chloride Accumulator"

DO NOT FORGET THIS.

THE CHLORIDE ELECTRICAL STORAGE CO., Ltd.,

PENDLEBURY,

MANCHESTER.

London Office:

39, Victoria Street, S.W.

OFFICIAL NOTICES.—*Continued from page 87.*

PONTYPRIDD URBAN DISTRICT COUNCIL.

ELECTRIC LIGHT AND TRAMWAYS DEPARTMENT.

To Manufacturers of Condensing Plant.

THE ABOVE COUNCIL invite Tenders for the supply and delivery of an independent Surface Condensing Plant, together with Circulating Pump, Air Pumps, Pipe Work, &c.

Specification, General Conditions, and Form of Tender, may be obtained on and after June 30th on application to the Electrical Engineer and Manager, upon payment to the undersigned of a deposit of £1 1s., which will, after the Council shall have entered into a Contract upon the Tenders received, be returned to the Tenderer, provided he shall have sent in a *bona fide* Tender, and shall have not withdrawn the same.

Tenders on the prescribed form, sealed and endorsed, must be received by the undersigned on or before MONDAY, the 12th JULY, 1909.

The Council do not bind themselves to accept the lowest or any Tender.

J. COLENSO JONES,
Clerk to the Council.

Municipal Buildings,
Pontypridd,
June 22nd, 1909. 4009

The Universal Electrical Directory.
1909 EDITION.
H. ALABASTER, GATEHOUSE & Co.,
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BINDINGS AND CASES.—Subscribers and others can have their half-yearly numbers bound handsomely in Black Cloth at the rate of 4s. per volume. Cases for binding are also supplied at 2s. 6d. each.—4, Ludgate Hill, London.

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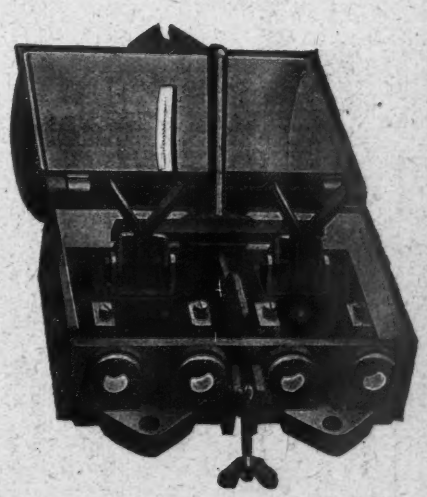

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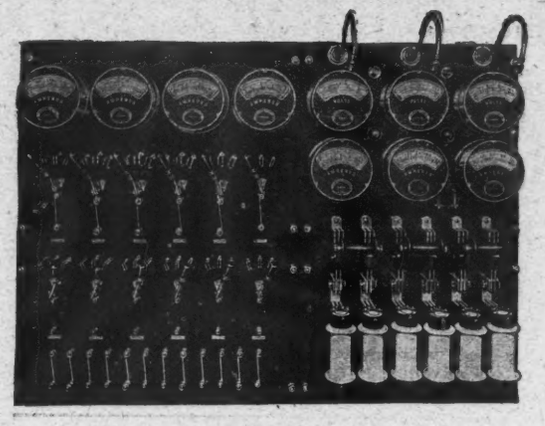

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Works: CONYBERE STREET, Birmingham.
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TOTAL PRODUCTION OVER 625,000 HP.

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COMPACT COMPLETE STEAM PLANT,

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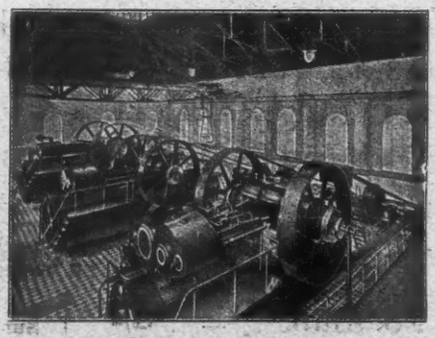

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TOTAL PRODUCTION OVER 625,000 HP.

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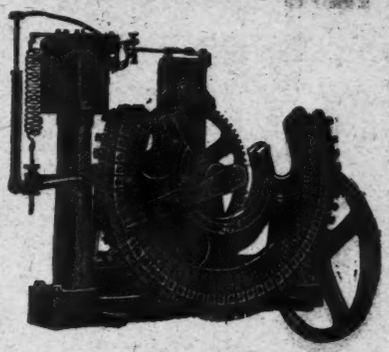

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The ever-increasing popularity of these apparatus affords abundant proof of their exceptional value.

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Write to-day.—NOW.

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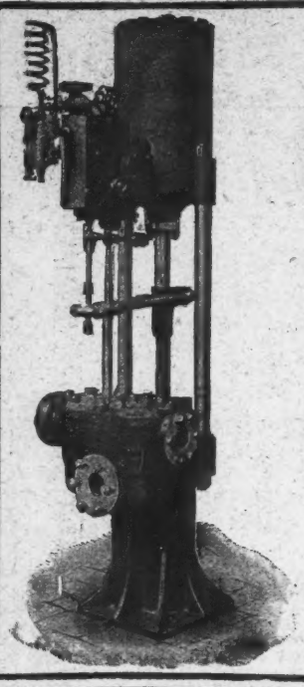

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An IDEAL Pump for Electric Stations,

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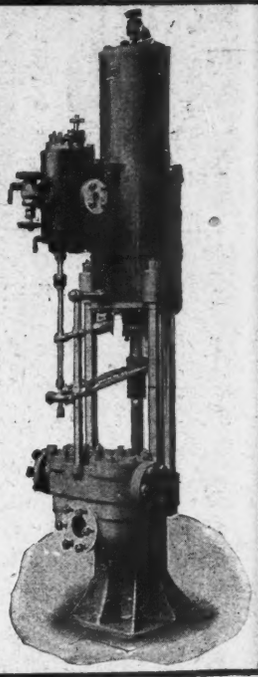

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FITTED WITH LOOSE HANDLE.

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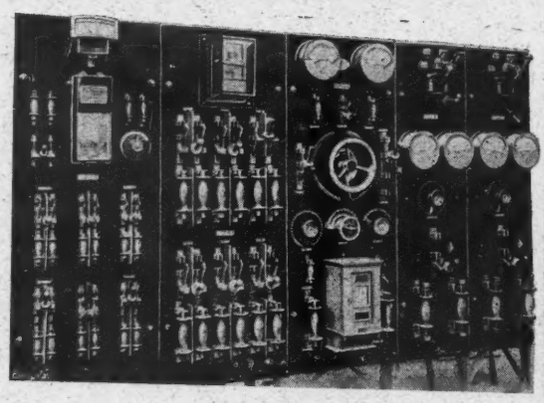

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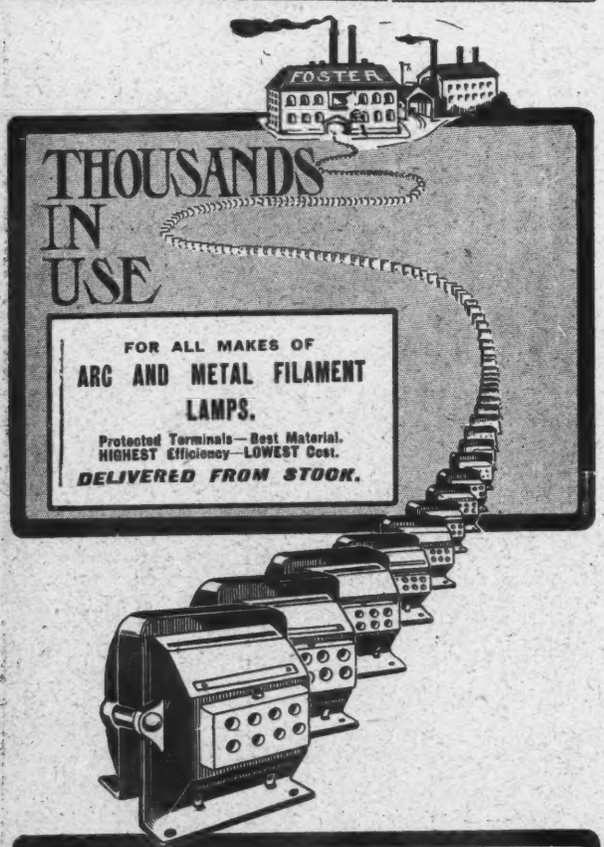

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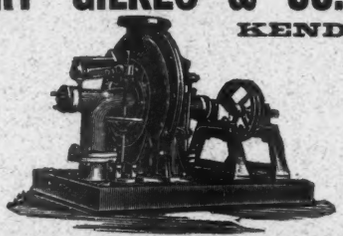

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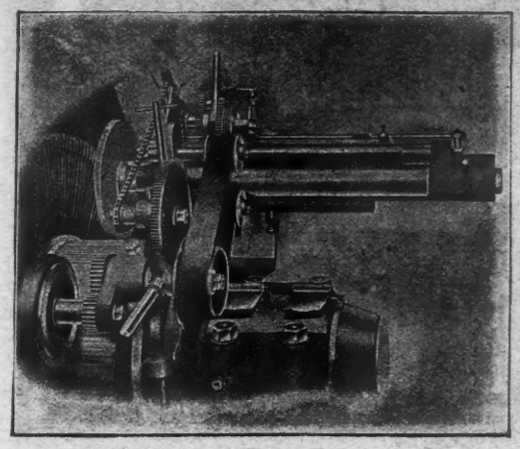

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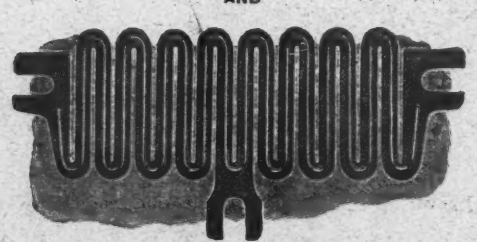
JUST  OUT

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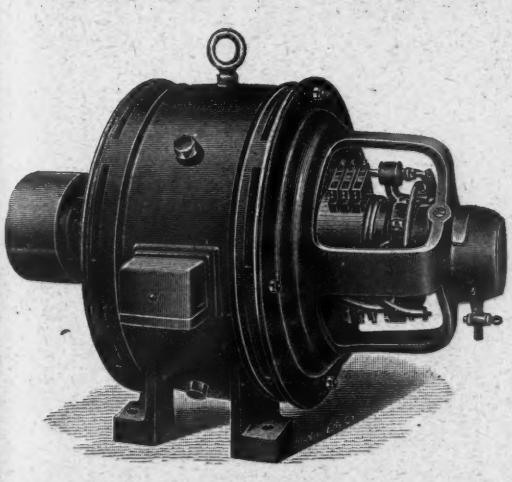

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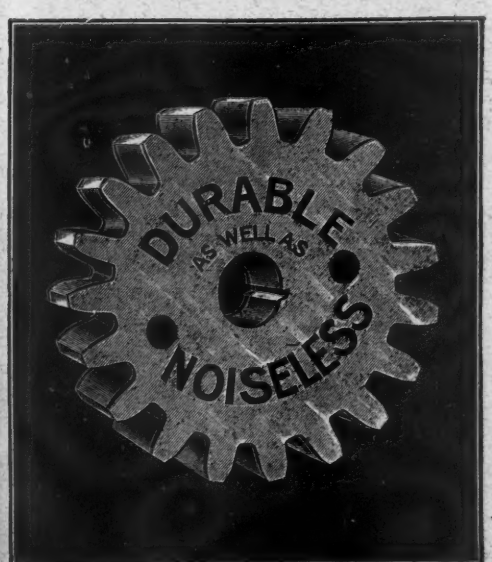

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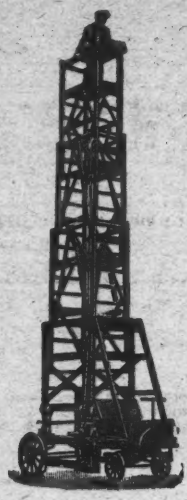

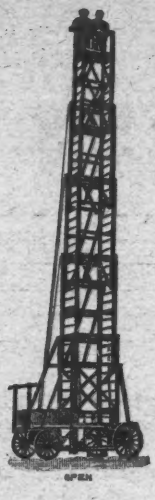

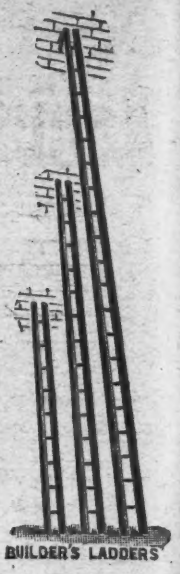

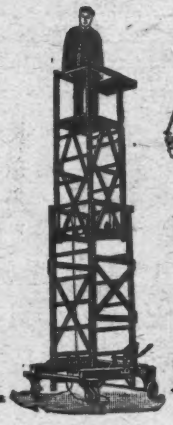

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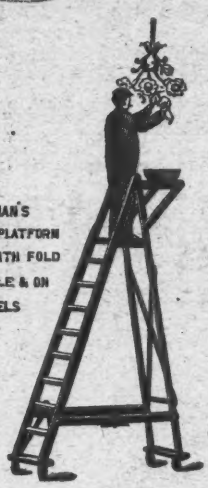

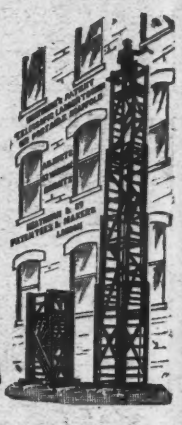

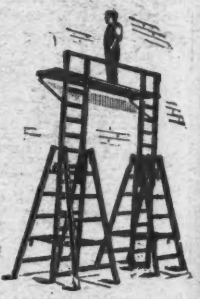

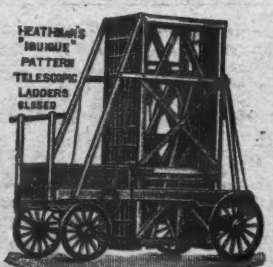

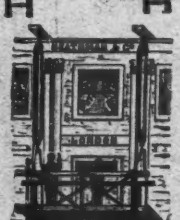

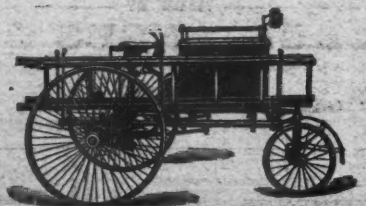

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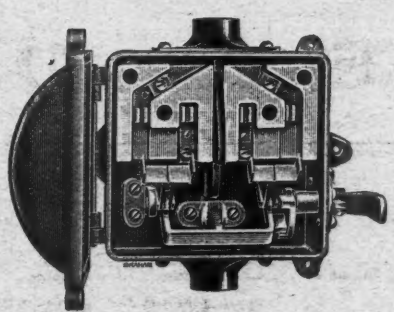

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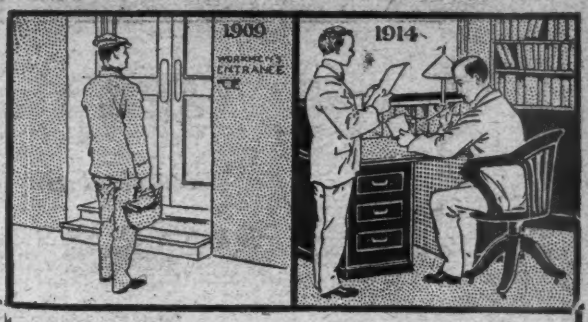

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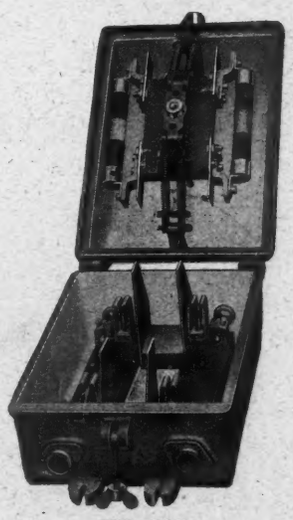

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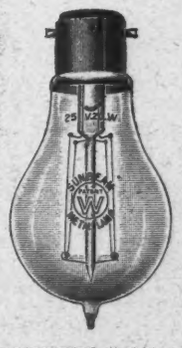

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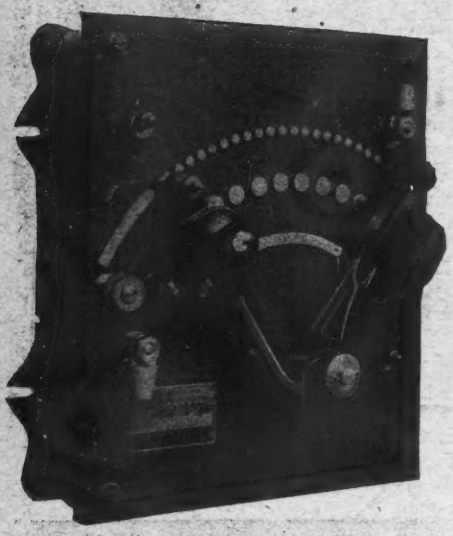

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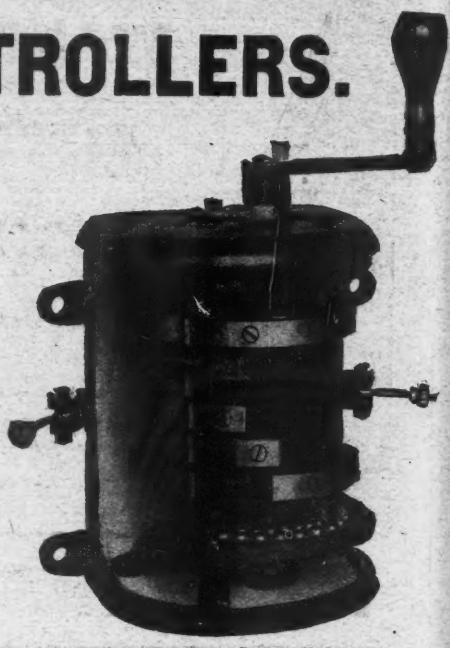

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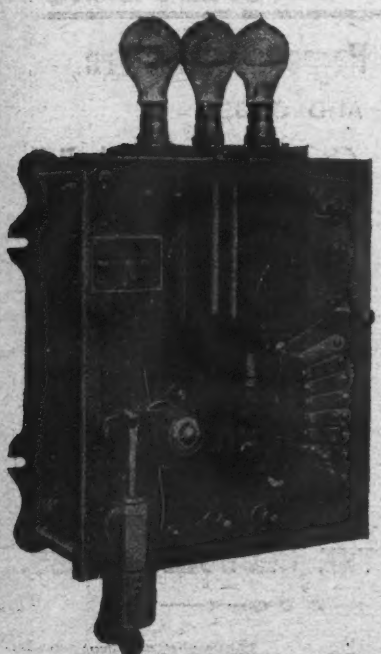
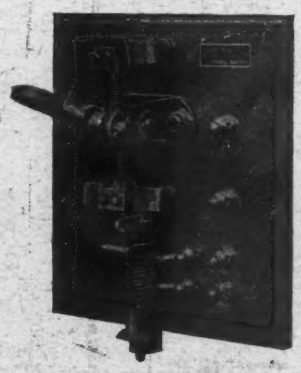
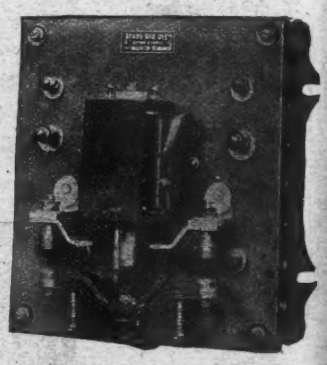


Self-Acting Motor-Starting Rheostat.



Pedal Switch.



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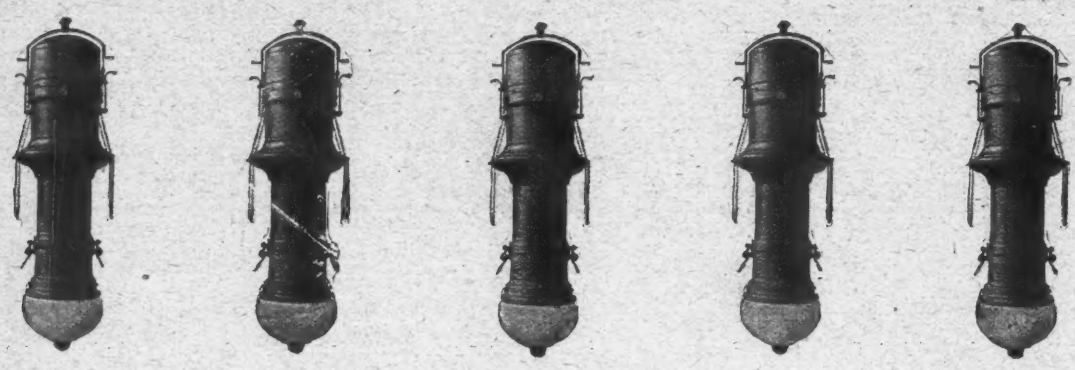

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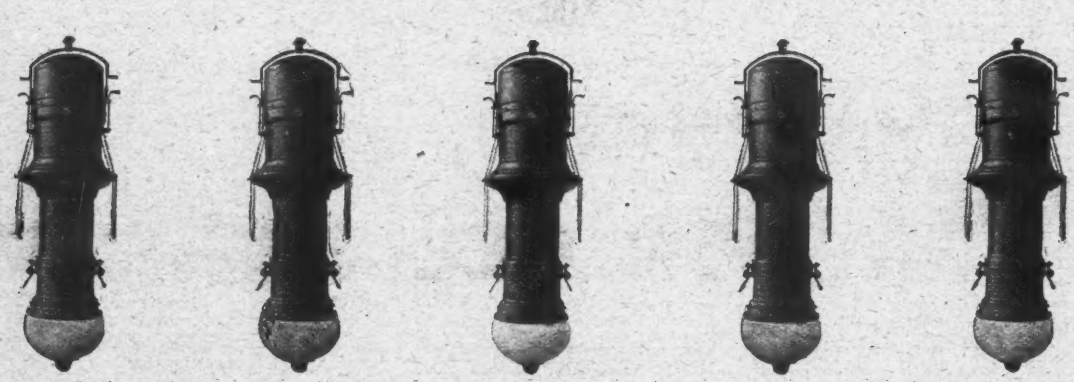

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CONTRACTORS' COLUMN.

[The following information is published in the interests of electrical contractors and others who are seeking for openings for new business. Considerable expense is incurred in the production of this column, and every care is taken to ensure that the information is new and accurate, but it will be understood that in a matter where so many correspondents are engaged, and where the amount of information to be handled is very large, this cannot always be guaranteed. If alleged inaccuracies are reported to the Editors, they will be fully investigated.]

ABERDEEN.—Buildings for the Prudential Assurance Co. (£8,000); P. Waterhouse, architect, Staple Inn Buildings, Holborn, W.C.

ABERDEENSHIRE.—Reconstruction of buildings at Echt; Burnett & Reid, 12, Golden Square, Aberdeen.

ADLINGTON (near CHORLEY).—Important additions to the Huyton Bleachworks.

APPLEBY.—Residence (£2,200); J. Hartley, architect, Swadford Chambers, Skipton.

ARMAGH.—Dwelling house at Ballyherridan, for W. Menary; S. Jervois, architect, 8, Seven Houses, Armagh.

BANCHORY, N.B.—Alterations at Town Hall; Brown & Watt, architects, 17, Union Terrace, Aberdeen.

BANFF.—Alterations to house on Rothie Estate; W. L. Duncan, architect, Turriff.

BARNSLEY.—Five houses, Firth Street, for G. H. Gray; 16 houses, Shaw Lane and Britannia Street, for P. Dalby; shop, Peel Street, for Rev. T. T. Taylor; 15 houses, Crompton Avenue, for G. Tock; eight houses and shop, Shaw Street, for Beckett & Foster; 10 houses, Day Street and Hall Street, for J. K. Taylor; six houses, Nicholas Street, for the Oak Mills Estate Co. Business premises, May Day Green; Crawshaw & Wilkinson, architects, 13, Regent Street, Barnsley.

BEDFORD.—Shops, Mill Street; Usher & Anthony, architects, 9, St. Paul's Square, Bedford; A. J. Dawes, builder, Priory Street, Bedford. New church, Queen's Park (£7,000); S. Foster, builder, Kempston.

BEXHILL-ON-SEA.—Proposed Territorial drill hall. Conversion of business premises into dwelling houses, and alterations to shop, Marina, for J. W. Webb; J. B. Wall, architect, 13, Devonshire Road, Bexhill. Additions to "St. Clare," Sutherland Avenue, for Col. Cutbill.

BIRMINGHAM.—Matron's house at the infirmary (£600); Board of Guardians.

BLACKBURN.—New church at Ewood; J. A. Seward, architect, 148, Church Street, Preston.

BLACKWOOD (MON.).—Thirty houses for the Park View Building Club; A. H. Davies, architect, Dock Street, Newport.

BRENTWOOD (ESSEX).—Alterations and additions to the Town Hall (£812); Selby & Co., builders, Leytonstone.

BRISTOL.—Public hall in connection with St. Paul's Church, Bedminster (£2,200); Scammell, Sons & Perkin, architects, 10, John Street, Bristol.

BRIXHAM (DEVON).—County school (£3,000); P. Morris, architect, 1, Richmond Road, Exeter.

BROADSTAIRS.—Additions to Kingsgate Castle, for Lord Avebury; detached house, Knight's Avenue, for H. A. Garnett; detached house, Pierremont Avenue, for A. Foster; detached house, Stanley Road, for H. Bousfield.

BROMLEY.—Prospective re-building (after fire) of premises for Cooper Bros., forage merchants, 19, Market Square; H. G. Dunn, upholsterer; G. Curwood, hosier; and others.

BURY.—Secondary School in Westminster Street; J. T. Halliday, architect, 14, John Dalton Street, Manchester.

BUSHEY.—Buildings at the Colne Valley water works for the Colne Valley Water Co.; alterations to the Foresters' Arms, Bushey Heath, for B. Bennett; alterations and additions to Oundle Hall, for E. H. Cuthbertson.

BUXTON.—Additions to bank, Cavendish Circus, for Williams, Deacon and Manchester and Salford Bank, Ltd., Manchester.

CAERLEON (near NEWPORT, MON.).—Training college (£25,000).

CALVERLEY (near LEEDS).—Offices, &c., at Ravensclife Mills; J. H. Bakes, Calverley Chambers, Victoria Square, Leeds.

CAMBRIDGE.—Workshop and stores, Newmarket Road; A. W. Redding, builder, Tennis Court Road. Wash-houses, &c., 32-38, Madingley Road, for the Master, Fellows and Scholars of Merton College, Oxford, owners. Offices, Homerton Street; J. S. Conder, builder, 146, Hills Road.

CARDIFF.—Proposed new Catholic Schools (£4,500); Rev. Father Hayde, rector. Four houses in Albany Road, for Williams & Hoare; Ware and Williams, architects, Charles Street, Cardiff. Thirteen houses in Pentre Street; E. W. M. Corbett, architect, Castle Street, Cardiff. New church at St. Luke, for Rev. G. H. Williams; G. E. Halliday, architect, 14, High Street, Cardiff. Rebuilding offices in Barleymow Lane, for F. W. Morgan; E. J. Jones, architect, Cardiff. Alterations to business premises, for Matthias Bros., Cowbridge Road; S. Williams, architect, Borough Chambers, Wharton Street, Cardiff. Additions to Bronwydd, for Sir A. Thomas, M.P.; C. J. Ward, architect, Cardiff. Three houses, Waterloo Road, for H. Jones; W. H. Scott, architect, 74, Stacey Road, Cardiff.

CARLISLE.—Skating rink; Oliver & Dodgshun, architects, Carlisle.

CARSHALTON.—Two houses, Carshalton Park Road; J. R. Burrage, architect, Mona Park Hill, Sutton.

CASTLEFORD (YORKS).—Two shops and houses; A. A. Holt, architect, Oxford Street, Castleford.

CASTLETON (near ROCHDALE).—Alterations and improvements at Albion Works; Messrs. O'Neill.

CHAPEL-EN-LE-FRITH.—New Primitive Methodist Schools, Market Street. Two pairs of houses, Manchester Road, for J. Fraser.

CHIPPENHAM.—House and shop, Sheldon Road, for Ainsworth & Pilcher.

CHOPWELL (Co. DURHAM).—Five shops for M. F. Rupp; D. M. Spence, architect, Shotley Bridge.

CLITHEROE.—Waterworks developments; Borough Engineer. Secondary school; Secretary of Education.

COATBRIDGE.—New manse for the E.U. Congregation (£950).

COLERIDGE.—Additions to factory (£990); R. Scrivener & Sons, architects, Hanley; W. Wardle, builder, Davenport Street, Longport.

COVENTRY.—Workshop (£1,750); H. Goode, builder, Coventry.

CRADLEY (WORCESTER).—School (£4,600); Pritchard & Pritchard, architects, Bank Buildings, Kidderminster.

CRAIGDDU (RHONDDA VALLEY).—Improvements at Council school; W. P. Nicholas, District Council Offices, Pentre.

CRAYFORD.—Re-erection, after fire, of power house at the leather works, for Bowron Bros.

CROMER.—Proposed new Wesleyan Church (£4,000).

CROOK (Co. DURHAM).—Alterations to the Belle Vue Workmen's Club and Institute; The Secretary.

DALTON (YORKS.).—Six houses, Long Lane; J. Berry, architect, 3, Market Place, Huddersfield.

DARLINGTON.—County school (£9,000); W. Rushworth, architect, Shire Hall, Durham.

DENBY AND CUMBERWORTH (YORKS.).—Extensions to Dearne Side Mills, Denby Dale, for J. Kenyon & Sons, fancy woollen manufacturers.

DENNY (STIRLINGSHIRE).—Manual training school (£1,200); J. Strang, architect, Falkirk.

DERBY.—Additions to the Vulcan Iron Works, for Ley's Malleable Castings Co., Ltd.; E. R. Ridgway, architect, Market Place, Long Eaton.

DEWSBURY.—Probable re-erection (after fire) of portion of works, for Wormalds & Walker, blanket manufacturers (damage, £4,000 to £5,000).

DONCASTER.—Primitive Methodist Church at Haxey.

DUMFRIES.—Adaptation of Moat House for hostel purposes; Barbour and Bowie, architects, Buccleuch Street, Dumfries.

DUNDEE.—Extensions to East Workhouse (£3,000); T. M. Cappon, architect, 32, Bank Street, Dundee.

DUNFERMLINE.—Conversion of houses into college class rooms, for Carnegie Trustees; Secretary of Trustees. Shops and houses, for A. & D. Lowe, Maygate; shop and tenement, for J. Lamond, Carnegie Street.

DURHAM.—New Sunday school premises adjoining the Rev. P. Campbell's Presbyterian Church.

EASINGTON (Co. DURHAM).—Offices and hall, Easington Colliery, for the Haswell Co-operative Society; F. Garvy, architect, 47, Church Street, West Hartlepool.

EAST KILBRIDE (N.B.).—Schools (£7,000); A. Cullen, architect, Brandon Chambers, Hamilton, N.B.

EASTNEY (near PORTSMOUTH).—Probable re-erection, after fire, of premises, Highland Road, for Chas. Pitt, house furnisher.

EDINBURGH.—Day school at Eden Grove, Falcon Avenue; Rev. Mons. Grady, St. Patrick's Rectory, 56, High Street, Edinburgh. Office and workshop at Blandfield Works; T. & H. Smith, Blandfield Chemical Works, Wheatfield Road, Gorgie, Edinburgh. Eight continuous villas in Comiston Road; J. C. White, builder, 34, St. Andrew Square, and 23, Comiston Drive, Edinburgh. Eight villas in Greenbank Crescent; D. Burton, 10, Parson's Green Terrace, Jock's Lodge, Piershill, Edinburgh. Villa at Hamilton Street, Joppa; P. Cameron, Hamilton Street, Joppa, Edinburgh. Eleven houses in Saughton Hall Drive; J. Duncan, builder, 1, Saughton Hall Drive, Edinburgh.

EVESHAM.—School for Worcester C.C.; A. B. Rowe, architect, 30, Foregate Street, Worcester.

EPSOM.—Fire station at Bromley Hurst (electric appliances required about £600); E. R. Capon, surveyor, U.D.C.

EXETER.—School for defective children; J. Jermans, architect, 1, Bedford Circus, Exeter.

FALKIRK.—Extension of dressing shop, for Scottish Central Iron Co., Ltd.; the manager. Alteration of premises, for W. Brown, watchmaker.

FOLKESTONE.—Printing works, Bayle Street, for F. J. Parsons, Ltd., The Bayle, Folkestone.

FOREST TOWN (NOTTS.).—Church (£4,000); L. Ambler, architect, Temple Chambers, Temple Avenue, E.C.

FROME.—Proposed secondary school; the U.D.C.

GATESHEAD.—Church for Christ Church parish; Hicks & Charlewood, architects, 67, Westgate Road, Newcastle-on-Tyne.

GELLYGAER (near CARDIFF).—Twenty houses and three shops, Ystrad Mynach, for G. & D. Jones. Four houses, Ystrad Mynach, for John Roberts. Two villas, Gilfach, for F. & R. Lewis. Thirty houses, for the Cascade Building Club.

GERRARD'S CROSS.—Residence, Vicarage Waye (£3,000); Lovell & Son, builders.

GLASGOW.—Church and hall; Rev. W. F. Knox, 31, St. Andrew's Drive, Pollokshields, Glasgow. Warehouse and stores, corner of Osborne Street and New Wynd; J. Gray, jun., potato merchant, 74, Osborne Street, Glasgow. Three tenements of dwelling houses, Kirkcaldy Road, Maxwell Park; Geo. Eadie, builder, 408, Matheson Street, Glasgow. Tenements, Moss Road, Govan; Robert Lockburn, Manor House, Manor Road, Dumbreck, Glasgow. Addition to dwelling, Steppa; Robert M. Green, Somerville Cottage, Cardowan Drive, Steppa. Factory for the Scottish Co-operative Society (£4,800); J. Davidson, architect, 95, Morrison Street, Glasgow. Buildings on Mary Street, Port Dundas; E. Macbean & Co ,Ltd., 123, Howard Street, Glasgow.

GODSTONE (SURREY).—Proposed extension of the Workhouse, for the B.G. (£5,700).

GOLCAR.—Renovation (after fire) of factory, for the Grosvenor Fire Lighter Co.

GOSPORT.—Baptist Church (£2,215); John Wills & Sons, architects, Victoria Chambers, Derby; J. Hunt, builder, South Wharf, Gosport.

GRANTHAM.—Residence at Belton Road, for Theodore Norton; B. J. Girling, architect, 1, St. Peter's Hill, Grantham.

GREENOCK.—Two tenement buildings at Seafield, for W. Kirkwood.

GUISBOROUGH.—Villa; W. G. Roberts, architect, 61, Albert Road, Middlesbrough.

HALESOWEN (near BIRMINGHAM).—Congregational Sunday schools (£2,500); A. P. Butler, architect,

HALIFAX.—St. Hilda's Church, Gibraltar Road; Sutcliffe & Sutcliffe, architects, 11, Argyle Place, London, W.

HAMMISH.—Church; W. Weatherley, architect, 4, Suffolk Street, Pall Mall, S.W.

HAMPTON WICK.—Probable re-instatement of premises, High Street, for Mr. Fraser, chemist and druggist (damage, £700).

HARPENDEN.—Nine houses, Coleswood Road, for J. Hall.

HELMSHORE.—Extensions at Sunnybank Mills; J. Porritt & Sons.

HERNE BAY.—Four houses, Salisbury Road, for H. E. Ramsey & Co., estate agents, Sea View Road, Herne Bay.

HIGH WYCOMBE.—Additions to the Church of England Schools. Four houses, Totteridge Avenue, for W. W. Coker.

HINDLEY (near WIGAN).—Eight houses, Cowburn Street, for R. C. Haworth; two houses, Swan Lane, for J. Wood.

HINDSFORD (near MANCHESTER).—New branch premises, for the Hindsford Co-operative Society.

HIRST (NORTHUMBERLAND).—Chapel; T. E. Davidson & Son, architects, Pearl Buildings, Northumberland Street, Newcastle-on-Tyne.

HODDESDON.—Baptist Church, Sunday schools and manse, in Burford Street and Essex Road.

HOUNSLOW.—Hospital; Franck & Wheeler, architects, c/o The Secretary, Hounslow Hospital Committee.

HUDDERSFIELD.—Alterations and additions to residence, Kirkburton; H. Brier, architect, Savilestown, Dewsbury. Detached house, Kidroyd, Almondbury; D. Bamford, architect, 88, Westgate, Huddersfield House, Linthwaite; Lunn & Kaye, architects, Milnsbridge.

ILKESTON.—Almshouses; H. T. Sudbury, architect, Lord Haddon Road, Ilkeston.

INCE (near WIGAN).—Enlargement of James Street Independent Methodist Church. Miners' Institute, Platt Bridge, for the Lancs. and Cheshire Miners' Federation. Four houses and shop, Gordon Street, for H. Dickinson.

ISLE OF MAN.—School at Castleton (£1,000); T. Cubbon, architect, Hamilton Street, Birkenhead.

KEIGHLEY.—Probable reinstatement (after fire) of premises for Hall & Stell, machinists, Dalton Lane (damage, £1,000).

KINGSTOWN (Co. DUBLIN).—Completion of baths.

KIRKCALDY.—Skating pavilion, for J. Laird, Glasgow.

KNUTSFORD (CHESHIRE).—Premises for the Waterproof Paper Co., Ltd.; The Secretary, Booth Mills, Knutsford.

LANARK.—Tenement in Cumbernauld Road, Muirhead, for A. Baillie, Glasgow.

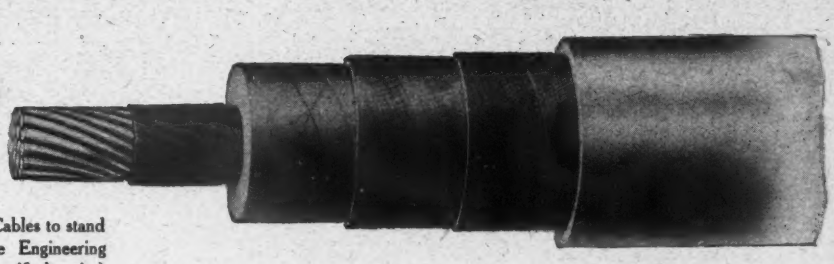
LEEDS.—Alterations to the Maternity Hospital.

(Continued on page 56.)

HELSBY CABLES.

"OZONE-PROOF" CABLE.

FOR HIGH VOLTAGES.



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We guarantee our "Ozone-Proof" Cables to stand the pressure tests specified by the Engineering Standards Committee for double the specified period.
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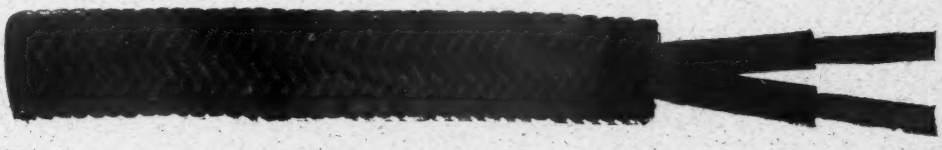

NON-METALLIC COVERING.

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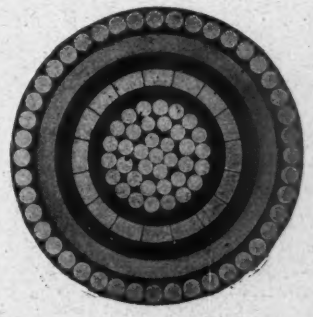
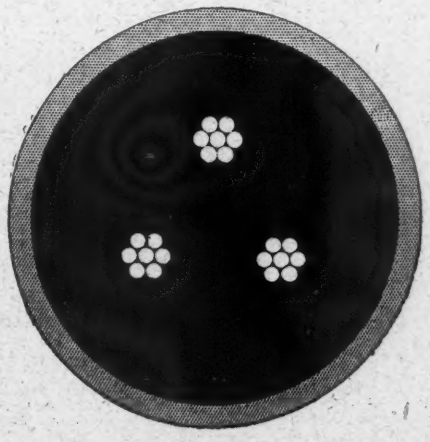
·2 Sq. Inch L.T. CONCENTRIC CABLE.

FOR A WORKING PRESSURE OF 220 VOLTS.

Armoured with Galvanised Iron Wires.

Tested to a pressure of 2,500 Volts.





·05 sq. Inch E.H.T. THREE-CORE CABLE.

FOR A WORKING PRESSURE OF 20,000 VOLTS.

Tests complied with:—

80,000 Volts after bending round Barrel 12 times diameter of Cable.

50,000 Volts for 3 Hours.

30,000 Volts for 5 Hours at a Temperature of 156° F.

90,000 Volts for 2 Minutes at a Temperature of 156° F.

PRESCOT MAINS.

CONTRACTORS' COLUMN.—*Continued from page 54.*

LEITH.—Halls and class rooms; Clerk, School Board, Leith. Extensions, Dunning Town Hall (£2,000); W. C. Laidlaw, architect, 116, Hanover Street, Edinburgh.

LITHERLAND (near LIVERPOOL).—New St. James' Church, Orrell Hey; Rev. T. E. M'Cormick, Vicar of Litherland.

LITTLEBOROUGH.—Seven houses in Broom Street; J. England.

LITTLEHAMPTON.—Shelter Hall for the U.D.C.; H. Howard, Surveyor to the Council.

LIVERPOOL.—Proposed new concert hall (seat 700); B. A. Malandrinos, Green Room Amateur Dramatic Society.

LLANWRIN (MONTGOMERYSHIRE).—School; J. Hutchins, architect, County Offices, Welshpool.

LONDON (BRIXTON, S.W.).—Proposed alterations to Brixton Hall, Acre Lane, for Electric Theatres, Ltd.; M. S. Ward, architect, 100, Victoria Street, S.W.

(KENSINGTON, S.W.).—House in Kensington Palace Gardens; W. Willett, builder, Sloane Square, S.W.

(HAMPSTEAD, N.W.).—Additions to Hilcote, Belsize Crescent, for G. Hirschhorn.

(CHELSEA, S.W.).—Buildings in King's Road; Elms & Jupp, architect, 25, Sackville Street, W.

(WOOLWICH, S.E.).—Buildings in Westmount Road; A. C. Corbett, M.P., 26, Hans Place, S.W. Tinning shop, Henley Road, for W. T. Henley's Telegraph Works Co., Ltd., North Woolwich. Additions to the infirmary; Church, Quick and Wincop, architects, 24, William Street, Woolwich, S.E.

(WANDSWORTH, S.W.).—Buildings between 78 and 84, North Side, Wandsworth Common, for F. E. Cain.

(LEWISHAM, S.E.—Four houses in Brownhill Road; Norfolk & Prior, architects, 4, Station Buildings, Catford Bridge, S.E.

(WIMBLEDON, S.W.).—Extensions to the Technical Institute; Jarvis and Richards, architects, 10, Queen Anne's Gate, S.W.

(ROTHERHITHE, S.E.).—Repairs at the infirmary, Lower Road; A. H. Newman, architect, 81, Tooley Street, London Bridge, S.E.

(MARYLEBONE, W.).—Depôt buildings, stables, &c., for the B.C. (£14,200).

(SHEPHERD'S BUSH, W.).—Block of shops; C. H. Millar, architect, 65, Chancery Lane, W.C.

(PLAISTOW, E.).—Additions and alterations to workshops and stables, Croydon Road; Hickman & Ferrey, surveyors, 99, Gresham Street, E.C.

(FOREST GATE, E.).—Alterations to Plough public-house, Field Road, for Davidson & Morris.

(EAST HAM, E.).—Six shops and houses, High Street North, Railway Bridge Approach; J. Byford, agent, 73, St. John's Road, East Ham.

(W.).—Additions to 53 and 55, Maida Vale; B. Fletcher & Sons, architects, 29, New Bridge Street, E.C.

(WEST HAM, E.).—School (£24,000); F. E. Hilleary, secretary, West Ham Education Committee.

(HORNSEY, N.).—Four houses, Glaslyn Road, Crouch End; J. Farrer, architect, 2, Coleman Street, E.C. Two houses, Connaught Gardens, Muswell Hill; Eyles, Lewis & Co., land agents, 85, Gresham Street, E.C.

(TOTTENHAM, N.).—Four double houses in Havelock Road, 14 in Seymour Avenue, and 28 in Thackeray Avenue; G. W. Rowley, builder, 278, Philip Lane, N. Addition to Crown Works, Fountayne Road, for Messrs. Millingtons; S. C. Tee, surveyor, 50, Moorgate Street, E.C.

(HOLBORN, W.C.).—Re-building Old Napier public-house; A. L. Guy, architect, 4, Verulam Buildings, Gray's Inn, W.C.

(NOTTING HILL, W.).—Premises for the Dunlop Co., Ltd.; E. K. Purchase, architect, 20, Maddox Street, W.

(DARTMOUTH STREET, S.W.).—New premises; Ford & Walton, builders, West End Lane, N.W.

(E.).—New London Association Baptist Chapel in Aldersbrook Road, South Wanstead.

(RUSSELL SQUARE, W.C.).—Secondary electric lighting system at the Hotel Russell; E. M. Duncan, 27, Old Queen Street, Westminster, S.W.

(HACKNEY, N.E.).—Warehouse, rear of 23 to 27, Triangle Road, West Street; W. A. Lewis, architect, 11 and 12, Finsbury Square, E.C.

(HAMMERSMITH, W.).—Addition to West London Hospital in Elm Grove; W. Harvey.

(SOUTHWARK, S.E.).—Building, 36, Blackfriars Road, for Brown's Estate, Ltd.; Field, Son & Glasier, surveyors, 54, Borough High Street, S.E.

(ISLINGTON, N.).—Alterations and additions to Mornington House, Canonbury Lane; Lovegrove & Papworth, architects, Town Hall Chambers, Old Street, E.C.

(TALLIS STREET, E.C.).—Additions to Carmelite House, for the *Daily Mail*; H. O. Ellis, architect, 46, Fenchurch Street, E.C.

MANCHESTER.—Prospective rebuilding after fire, of warehouses in Sackville Street, Portland Street (£20,000 damage). New premises, Corporation Street, for Co-operative Wholesale Society. New schools off Whitworth Street; R. Neill & Sons, builders, Manchester. New warehouses, Lloyd's Packing Warehouses, Ltd; H. Fairhurst, architect, Spring Gardens, Manchester. New premises, Whitworth Street, for Union Bank Co., Manchester. Moseley Road School, Fallowfield; Secretary, Education Offices, Deansgate, Manchester.

MARSDEN (near HUDDERSFIELD).—Renovation, after fire, of Bank Bottom Mills (damage, £15,000); J. E. Crowther, woollen manufacturer.

MERTHYR TYDFIL.—Two pairs semi-detached villas, The Walk; T. E. Rees, architect, Merthyr Tydfil.

METHIL (FIFE).—Five shops and row of houses at Denbeath, for R. Galloway.

MIDDLESBROUGH.—Alterations to business premises, 179 and 181, Newport Road, for Messrs. Berger's, boot and shoe dealers.

MOGERHANGER (near SANDY).—New school, for Beds. C.C.; H. Leete, surveyor to Hunts. C.C., architect.

MUIRHEAD (LANARKSHIRE).—Tenement, Cumbernauld Road; A. Baillie, Cumbernauld Road, Muirhead.

NEWBIGGIN-BY-THE-SEA.—Extensions to schools, for Northumberland C.C.; C. Williams, Education Secretary, The Moot Hall, Newcastle-on-Tyne.

NEWBRIDGE (MON.).—Thirteen villas (£263 each); A. J. Bowen, architect, Crumlin, Mon.; A. S. Morgan & Co., builders, Newport.

NEWMILLS (Co. TYRONE).—New Presbyterian manse contemplated.

NEW ROSS (IRELAND).—New college for Augustinian Fathers; J. A. Ryan, architect, Waterford.

NEW SEAHAM.—Conversion of the Drill Hall into church institute (£400); Rev. A. Ramsbotham, vicar.

NEWTOWN.—Probable re-erection (after fire) of works for Jones & Leach, wood turners (damage, £6,000 to £7,000).

NORTHWICH.—Men's Institute in connection with the Congregational Church.

OLDHAM.—Renovation (after fire) of Primrose Mills; W. & J. Lees.

OTTERBURN (NORTHUMBERLAND).—United Methodist Church.

OXSHOTT.—House (£2,000); A. S. Taylor, architect, 27, Old Queen Street, S.W.

OYNE (ABERDEENSHIRE).—Repairs to manse and offices of Oyne; G. B. Mitchell, architect, Union Street, Aberdeen.

PAISLEY.—Corehouse for R. B. M'Leish, ironfounder, M'Gown Street.

PENSHAW.—Parish Hall (£2,000); J. Pallister, architect, Philadelphia, Fence Houses, Durham.

PENSNETT (near DUDLEY).—New Council school (250 children); G. Balfour, Director of Education, County Education Offices, Stafford.

PLYMOUTH.—Re-construction of school, Sutton Road, and alterations at Public School (£1,000); Hine, Odgers & May, architects, 28, Lockyer Street, Plymouth. Alterations to Grey Coat School; King and Lister, architects, 8, Princess Square, Plymouth.

PONTYGWAITH.—Extensions to County School; W. P. Nicholas, District Council Offices, Pentre, Rhondda.

PORTSMOUTH.—Houses. Whitwell Road; W. W. Evans, 4, Bruce Road, Portsmouth. Four houses, Posbrooke Road; C. H. Hancock, Hyde Park Road, Southsea. Additions to 18, Clarence Parade, for Major Hicks. Swimming bath, North End; J. Murch, borough engineer.

RAMSGATE.—Alterations and additions to Haine Hospital, for the Isle of Thanet Joint Hospital Board; H. B. Langham, architect, Bank Chambers, Broadstairs.

RATHANGAN (KILDARE).—New schools for the Rev. P. Campion; W. H. Byrne & Son, architects, 20, Suffolk Street, Dublin.

RICHMOND-ON-THAMES.—Ten houses, Mount Ararat Road, for S. D. Gough. Nine houses, Defoe Avenue, North Sheen, for F. J. Loveday.

ROMFORD.—Four houses, Carlisle Road, for G. J. Harvey.

ROYTON (near OLDHAM).—Parish Church Institute; E. Woodhouse, architect, 88, Mosley Street, Manchester.

ST. ALBANS.—Alterations and additions to the Middlesex County Asylum, Napsbury (582 more patients); R. Plumbe, architect, 13, Fitzroy Square, W.

SALFORD.—Proposed new sub-station (between £3,000 and £4,000) with equipment; V. A. H. M'Cowen, borough electrical engineer.

SALTBURN.—Primitive Methodist Church at West Loftus.

SEVENOAKS.—Ten shops; S. Hart, architect, Bush Lane House, Cannon Street, E.C.

SHAW (LANCS.).—Fourteen houses, off Queen Street, for J. Watson.

SHERBORNE (DORSET).—Digby Memorial Hall (£2,200); C. & C. B. Benson, architects, 11, Hendford, Yeovil; Guppy & Son, builders, Sherborne.

SKEWEN (near NEATH).—Two shops in New Road; R. Thomas, Miners' Arms, Skewen.

SHREWSBURY.—Office, stores, stables, workshops, &c., for the T.C. (£8,000), also municipal slaughter-houses (£8,080).

SOUDLEY (GLOS.).—Proposed new church.

SOUTH SHIELDS.—New shops, 204, Ocean Road, for S. Thubrow; J. J. Dockwray, architect, 168, Hyde Street, South Shields. Extension to Bethesda Free Church, Victoria Road; H. Grieves, architect, King Street, South Shields. New parish church, Gilbert Street. Probable re-erection, after fire, of premises, corner of Bertram Street, for the Tyne Dock Industrial Co-operative Society.

STAFFORD.—Additions to warehouse, St. Chad's Place, for R. T. Jennings and Son; three houses, Austin Friars, for J. Shropshall. House at Doxey, for W. Weaver. 11, Middle Friars; Stafford House at Salt, for W. Deakin, 14, Victoria Terrace, Stafford.

STIRLING.—Additions to Bannockburn school; Clerk, St. Ninian's School Board, Stirling. Shooting lodge at Cashley, for Sir Charles Cayzer.

STOCKTON-ON-TEES.—Café, Bondgate, for Messrs. Laverick.

STOW BRIDGE (NORFOLK).—Alteration and improvement of school; T. A. Cox, secretary, Education Offices, Norwich.

STOURMINSTER (NEWTON).—School (£1,200); W. J. Fletcher, county surveyor, Wimborne.

SWANSEA.—Extension of central police station; Geo. Bell, surveyor to the T.C. Three houses, Manselton Road; J. & F. Weaver, builders, Manselton Steam Joinery Works, Swansea. Three houses, Monterey Street, Manselton; G. Davies, builder, Manselton Road, Manselton, Swansea. Rebuilding shop in College Street; C. Maries, builder. Rebuilding shop in Castle Street; Masters and Co., Castle Street.

SWANTON ABBOTT (NORFOLK).—Alteration and improvement of school; T. A. Cox, secretary, Education Offices, Shire Hall, Norwich.

TARBRAX (CARNWATH, N.B.).—School (£2,200); J. & E. Pearson, architects, 19, Queen Street, Edinburgh.

TAUNTON.—Rebuilding of business premises, East Street, for Edward Love and Son, builders.

TEDDINGTON.—Eight houses, Winchenden Road; G. A. Gale, builder, Heath Road, Twickenham.

TIVERTON.—New schools; W. H. Ashford, architect, 90, New Street, Birmingham.

TODDINGTON (near DUNSTABLE, BEDS.).—School, for the C.C.; Gotch and Saunders, architects.

TREHERBERT.—Alterations to Royal Oak Hotel; W. D. Morgan, architect, 194, Ystrad Road, Pentre.

TURTON (near BOLTON).—Additions to Meetings Bleach Works; Eden and Thwaites, Ltd.

TYLDESLEY.—New branch premises, for the Tyldesley Co-operative Society.

UPWELL ST. PETER (NORFOLK).—Alteration and improvement of school; T. A. Cox, Secretary, Education Office, Norwich.

WALKDEN.—Additions to Oakwood House; E. & G. A. Lane, Hope Mills, Walkden. Proposed technical school in Walkden Road (£9,250).

WATFORD.—Petrol store, Tipples Yard, High Street, for the Consolidated Petroleum Co. Five houses in Queen's Avenue, for E. Richardson.

WEMBLEY.—Extension of the public offices, Harrow Road, including new fire station; C. R. W. Chapman, Surveyor to the Urban District Council.

WHALEY BRIDGE.—Sewage works scheme contemplated; Surveyor, Council Offices, Whaley Bridge.

WHITEHAVEN.—Laundry; J. Ramsey, architect, Market Place, Whitehaven.

WHITLEY BAY.—Proposed skating rink for the Whitley Park Hotel Co.

WIDNES.—Extensions to works, Ditton Road, for Todd Bros., iron merchants. Skating rink, Cross Street, for Mr. Martin. Fifteen houses, Moorfield Road, for M. Johnson.

WINCHELSEA.—Restoration of the parish church.

WITHERNSEA.—Shop and lavatories for the U.D.C.; J. B. Kirton, surveyor, Exchange Buildings, Lowgate, Hull.

WOMBWELL.—Houses, shops and workshops, High Street, for J. Redfearn. Houses and shops, Barnsley Road, for A. B. Linford. Five houses, John Street, for Adam Taylor.

WORSLEY.—Alterations to Brookfield House; owner.

WYLAM (NORTHUMBERLAND).—School (£3,500); W. Forrest, architect, Moot Hall, Newcastle-on-Tyne; E. Henderson & Son, builders, Pontelland, Northumberland.

YEOVIL.—Additions to factory, for Thring & Luffman, glove manufacturers, Reckleford. Foundry, Reckleford, for J. B. Petter & Sons, Ltd.

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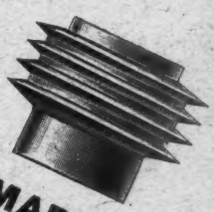

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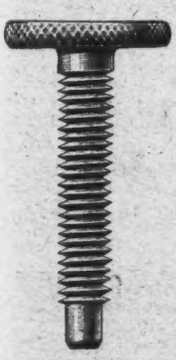

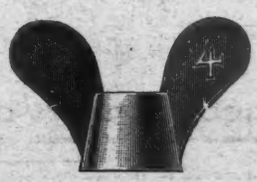

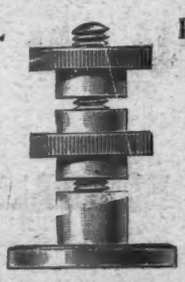

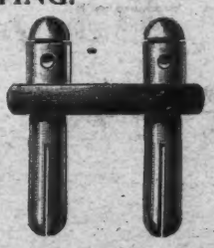

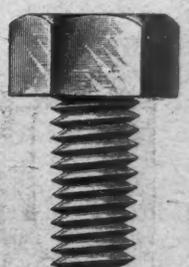

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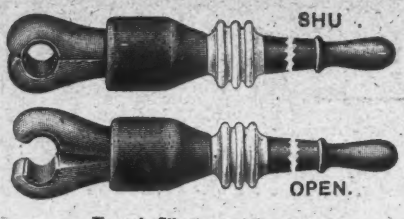

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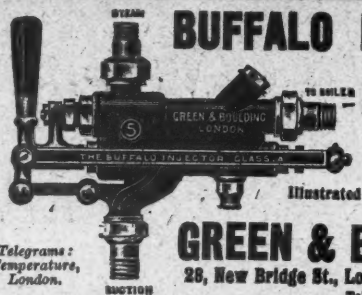

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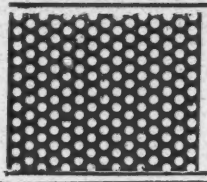

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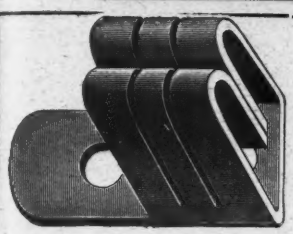

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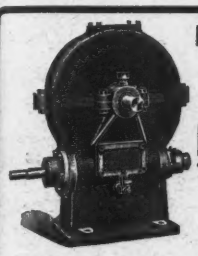

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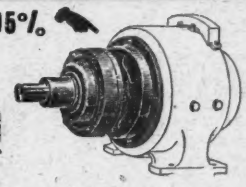

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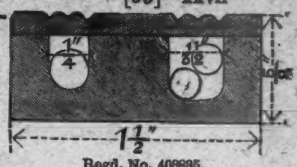

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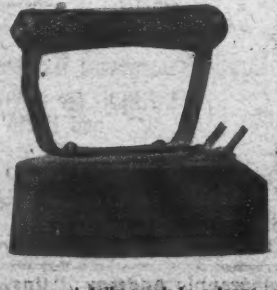

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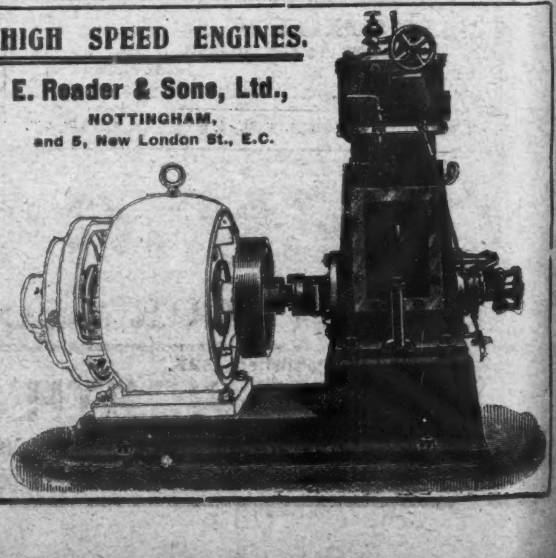

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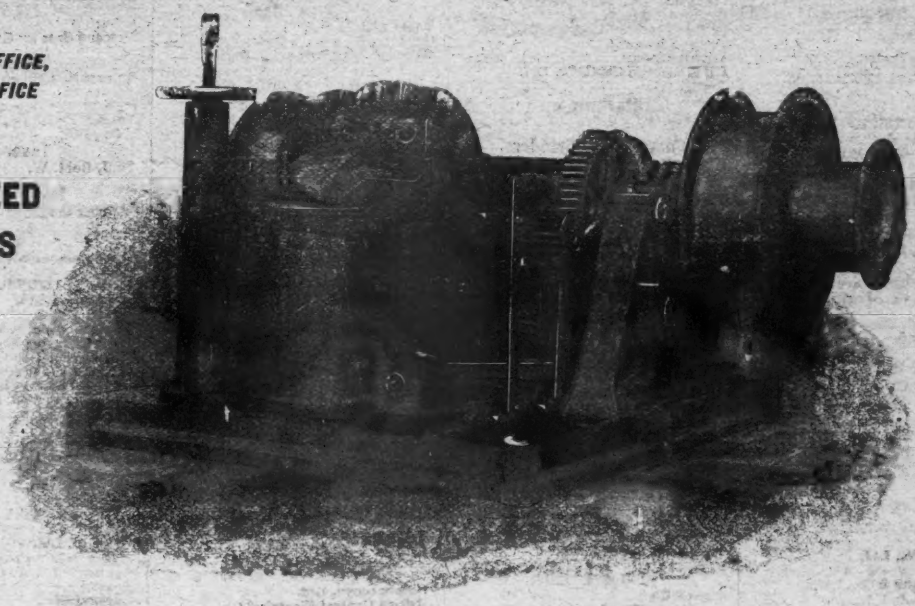

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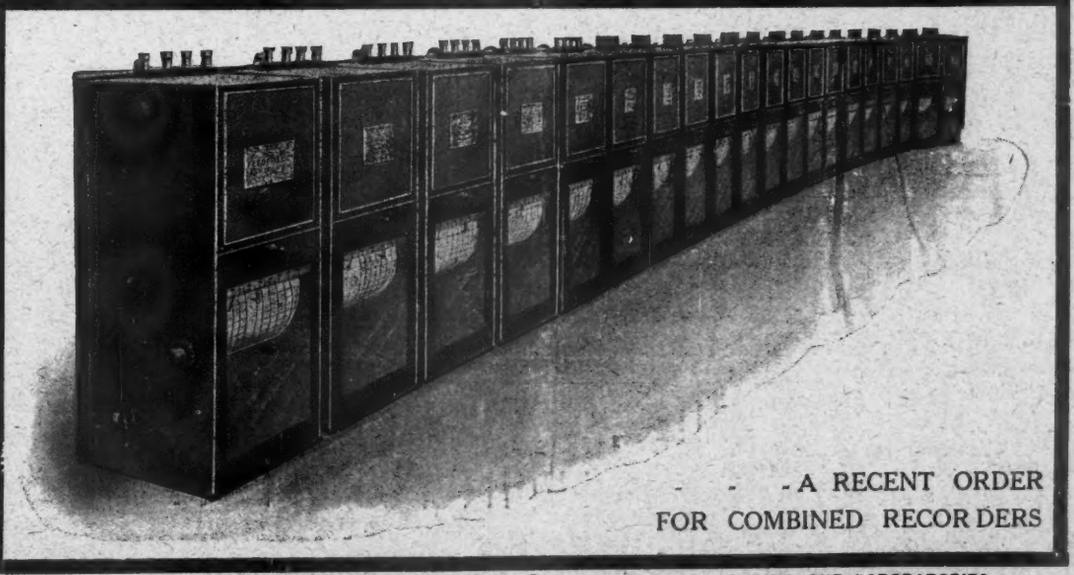

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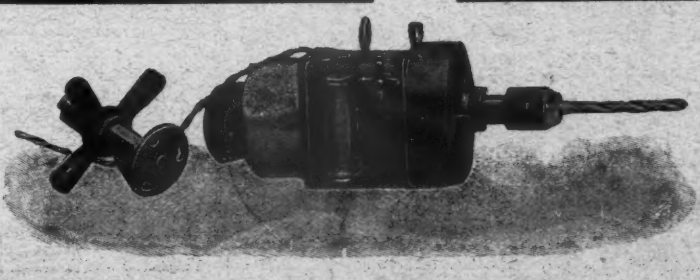

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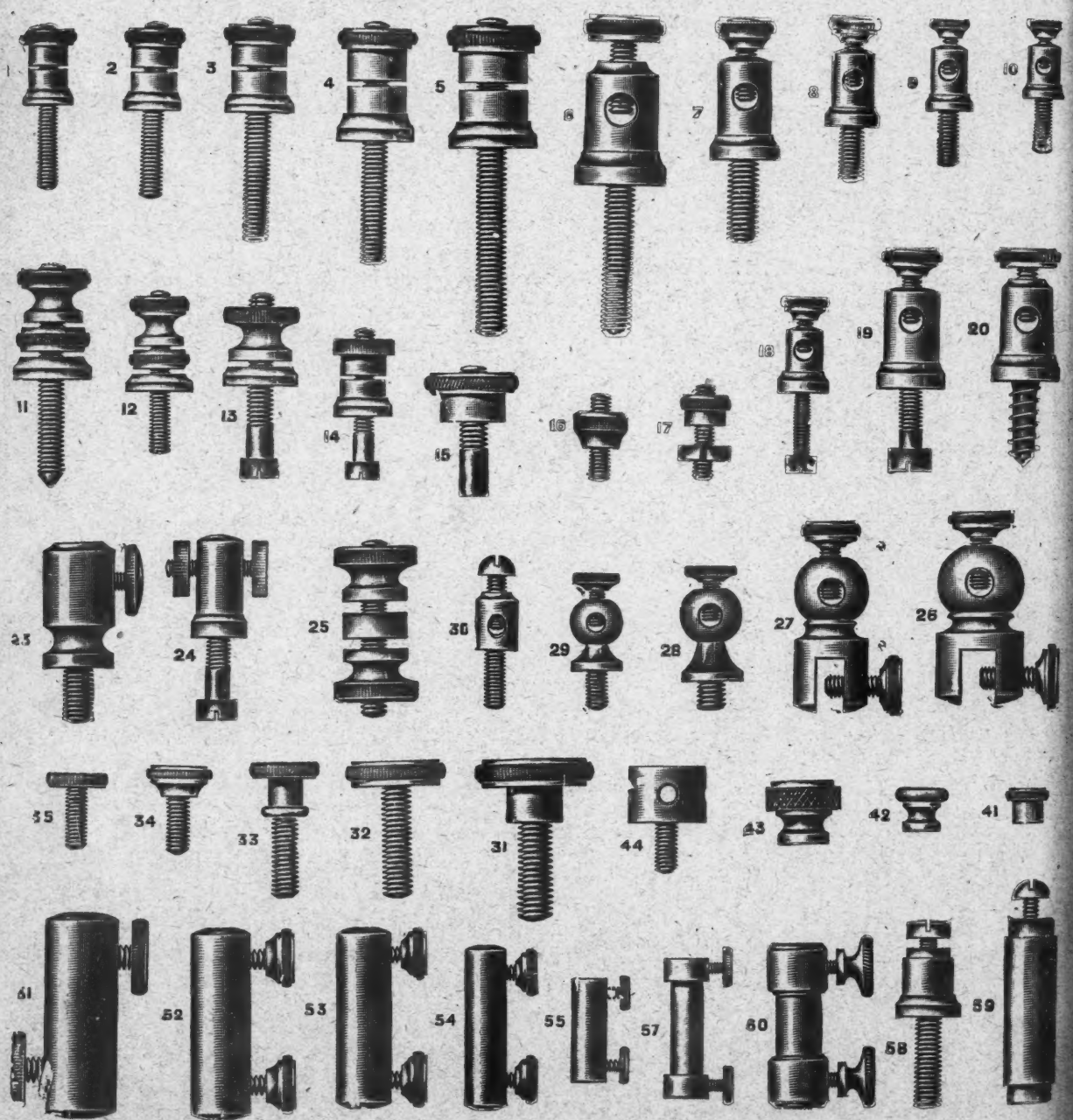

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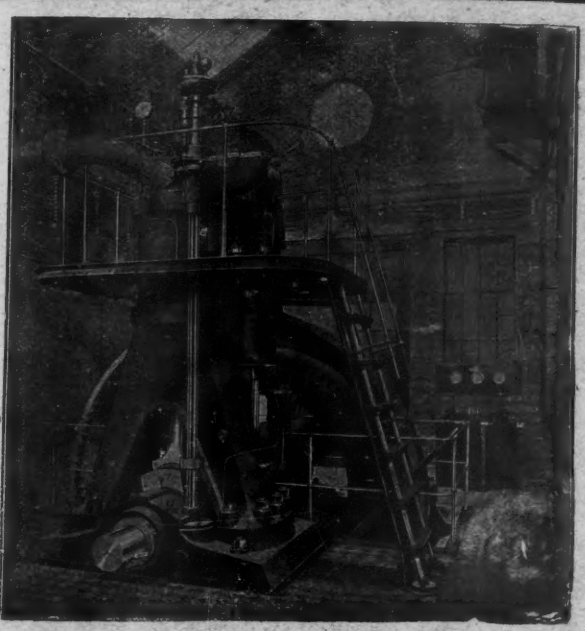

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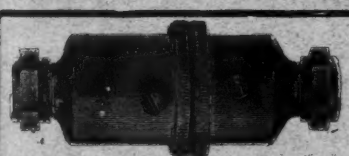

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